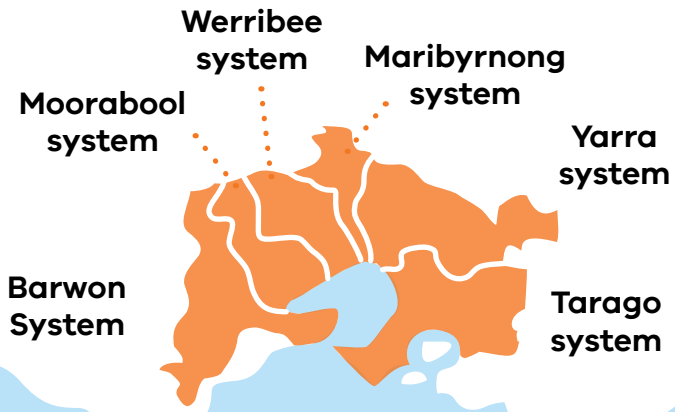
SECTION 3:
Central region



3.1 Central region overview

The systems in the central region that can receive water from the VEWH's environmental entitlements are *Birrarung* (Yarra River) and Tarago River in the east and *Weariby Yallok*[1] (Werribee River), Moorabool River, upper Barwon River and lower Barwon wetlands in the west. The VEWH does not hold an environmental entitlement in the Maribyrnong system, but in some years the VEWH purchases allocation to allow delivery of water for the environment in selected reaches of the Maribyrnong system.

Environmental values, objectives and planned actions for delivering water for the environment for each system in the central region are presented in the system sections that follow.

Traditional Owners in the central region

Traditional Owners in the central region have a deep connection to Country that has endured for tens of thousands of years. This includes inherent rights and cultural obligations to Country and community.

The Bunurong Land Council Aboriginal Corporation, Eastern Maar Aboriginal Corporation, Wadawurrung Traditional Owners Aboriginal Corporation and Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation are the Registered Aboriginal Parties (RAPs) under the Victorian *Aboriginal Heritage Act 2006* for the areas incorporating waterways covered by this section of the seasonal watering plan.

The Eastern Maar Aboriginal Corporation holds Registered Aboriginal Party (RAP) status under the Victorian *Aboriginal Heritage Act 2006* over a large portion of land in south-west Victoria. Eastern Maar gained formal recognition of their rights under the Commonwealth *Native Title Act 1993* for over half of the RAP area and in March 2024, the Federal Court of Australia handed down a third native title determination. In relation to this seasonal watering plan, the Eastern Maar native title covers parts of the Barwon River catchment. The native title determinations acknowledge Eastern Maar's ongoing connection and intrinsic relationship to Country in south-western Victoria.

Water from the Country of the Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) and the Taungurung Land and Waters Council (TLaWC) can be diverted into the central region. GLaWAC is a RAP and native title holder within the central region geographic area and has a Recognition and Settlement Agreement with the Victorian Government. Gunaikurnai waterways managed with water for the environment are covered in the Gippsland region section of this seasonal watering plan. TLaWC is a RAP and has a Recognition and Settlement Agreement with the Victorian Government. Taungurung waterways managed with water for the environment are covered in the northern region section of this plan.

Traditional Owner objectives for water in the central region have been acknowledged in several strategies and plans recently, including the *Rivers of the Barwon (Barre Warre Yulluk) Action Plan*, the *Waterways of the West Action Plan*, the *Yarra Strategic Plan (Burndap Birrarung burndap umarkoo)*, and the *Central and Gippsland Region Sustainable Water Strategy*.

The Victorian Government is committed to self-determination for Traditional Owners through Treaty negotiations and policies such as ***Water is Life: Traditional Owner Access to Water Roadmap 2022***. The VEWH and its program partners are working with Traditional Owners to embed the outcomes of government policy in the Victorian environmental watering program. Program partners in the environmental watering program are aware that structural changes (such as legislative, policy and governance changes) to how water is managed may be made in the future in recognition of Aboriginal water rights. Program partners have heard that Traditional Owners want empowerment and agency in water management and, in many cases, want to manage water on Country on their own terms.

1 Bunurong name for the Werribee River

Engagement

Engagement with Traditional Owners, stakeholders and local communities informs the environmental watering program. Program partners undertake extensive engagement at the local level to understand community priorities for the delivery of water for the environment in the coming year.

Program partners also seek to understand how cultural, social, economic and recreational values, uses and objectives may be supported by delivering environmental flows. Opportunities to support these values, uses and objectives are incorporated into watering decisions where possible, provided they do not compromise environmental outcomes. The following system sections present cultural, social, economic and recreational values for each system in the central region.

Engagement, including through other strategies, plans and processes, also informs environmental objectives. These include regional catchment strategies, regional waterway strategies and technical studies such as environmental flows studies and environmental water management plans. Traditional Owner cultural objectives for environmental flows may refer to cultural flows studies, Aboriginal Waterway Assessments, Traditional Owner Country Plans and other tools. These strategies, plans and technical reports describe a range of environmental, economic, social and Traditional Owner perspectives and longer-term objectives that influence actions and priorities for water for the environment.

Table 3.1.1 Program partners and stakeholders that engaged with the Corangamite CMA to develop seasonal watering proposals and key documents informing the proposals for the Moorabool system, upper Barwon River and lower Barwon wetlands (in alphabetical order)

	Moorabool system	Upper Barwon River	Lower Barwon wetlands
Community groups and environment groups	• Corangamite Waterwatch • Geelong Landcare Network • Moorabool Catchment Landcare Group • People for A Living Moorabool	• Birregurra Landcare Group • Environment Victoria • Friends of the Barwon • Geelong Field Naturalists Club • Land and Water Resources Otway Catchment • Otway Agroforestry Network Ltd • Upper Barwon Landcare Network • Winchelsea Land and Rivercare Group	• EstuaryWatch • Friends of the Barwon • Geelong Environment Council • Geelong Field Naturalists Club
Government agencies	• Barwon Water • Central Highlands Water • Department of Energy, Environment and Climate Action • Parks Victoria • Southern Rural Water • Victorian Environmental Water Holder	• Barwon Water • Colac Otway Shire Council • Department of Energy, Environment and Climate Action • Southern Rural Water • Victorian Environmental Water Holder	• Barwon Water • City of Greater Geelong • Department of Energy, Environment and Climate Action • Parks Victoria • Southern Rural Water • Victorian Environmental Water Holder • Victorian Fisheries Authority
Landholders/ farmers	• Landholders on the Moorabool Stakeholder Advisory Committee	• Individual landholders	• Individual landholders

	Moorabool system	Upper Barwon River	Lower Barwon wetlands
Local businesses	• Adelaide Brighton Cement		• Commercial eel fishers
Recreational users		• Individual users	• Field and Game Australia (Geelong Branch) • Geelong Gun and Rod Association Inc. • VRFish
Traditional Owners	• Wadawurrung Traditional Owners Aboriginal Corporation	• Wadawurrung Traditional Owners Aboriginal Corporation • Eastern Maar Aboriginal Corporation	• Wadawurrung Traditional Owners Aboriginal Corporation

Table 3.1.2 Program partners and stakeholders that engaged with Melbourne Water to develop seasonal watering proposals and key documents informing the proposals for the Yarra, Tarago, Maribyrnong and Werribee systems (in alphabetical order)

	Yarra system	Tarago system	Maribyrnong system	Werribee system
Community groups and environment groups	• Abbotsford Riverbankers • Collingwood Children's Farm • Environment Victoria • Friends of Yarra Flats Park • Friends of Yarran Dheran Nature Reserve • Independent community members • Native Fish Australia • Waterwatch Coordinators • Warringal Conservation Society • Yarra Riverkeeper	• Cardinia Environment Coalition • Environment Victoria • Friends of Mt Cannibal Flora and Fauna Reserve • Friends of Robin Hood Reserve • Bunyip Landcare • Independent community members • Native Fish Australia • Waterwatch coordinators	• Environment Victoria • Friends of Holden Flora Reserve • Friends of the Maribyrnong Valley Inc. • Independent community members • Jacksons Creek EcoNetwork • Friends of Steele Creek • Maribyrnong River and Waterways Association • Native Fish Australia • Waterwatch Coordinators	• Ecolinc • Environment Victoria • Friends of Toolern Creek Reserve • Friends of Werribee Gorge & Long Forest Mallee Inc. • Independent community members • Moorabool Environment Group/Platypus Alliance – Bacchus Marsh • Native Fish Australia • NatureWest • Pinkerton Landcare and Environment Group • Waterwatch Coordinator • Werribee Riverkeeper • Western Region Environment Centre

	Yarra system	Tarago system	Maribyrnong system	Werribee system
Government	• Banyule City Council • City of Boroondara • City of Melbourne • City of Whittlesea • Commissioner for Environmental Sustainability Victoria • Department of Energy, Environment and Climate Action • Environment Protection Authority Victoria • First Peoples – State Relations • Manningham City Council • Melbourne Water (Service Delivery) • Nillumbik Shire Council • Parks Victoria • Victorian Fisheries Authority • Victorian Freshwater Fish Habitat & Flows Roundtable • Yarra City Council • Yarra Ranges Shire Council	• Baw Baw Shire Council • Cardinia Shire Council • Commissioner for Environmental Sustainability Victoria • Department of Energy, Environment and Climate Action • Environment Protection Authority Victoria • First Peoples – State Relations • Melbourne Water (Service Delivery) • Parks Victoria • Southern Rural Water • Victorian Fisheries Authority • Victorian Freshwater Fish Habitat & Flows Roundtable	• Commissioner for Environmental Sustainability Victoria • Department of Energy, Environment and Climate Action • Environment Protection Authority Victoria • First Peoples – State Relations • Greater Western Water • Hume City Council • Maribyrnong City Council • Melbourne Water (Service Delivery) • Moonee Valley City Council • Parks Victoria • Southern Rural Water • Victorian Fisheries Authority	• Commissioner for Environmental Sustainability Victoria • Department of Energy, Environment and Climate Action • Environment Protection Authority Victoria • First Peoples – State Relations • Greater Western Water • Melbourne Water (Service Delivery) • Melton City Council • Parks Victoria • Southern Rural Water • Victorian Fisheries Authority • Wyndham City Council
Landholders/ farmers	• Individual landholders • Licensed diverters	• Individual landholders	• Licensed diverters from the Maribyrnong River at Keilor	• Individual landholders • Zoos Victoria

	Yarra system	Tarago system	Maribyrnong system	Werribee system
Local businesses	• Doon Reserve Caravan Park • East Coast Kayaking • Melbourne Adventure Hub • Sea Kayak Australia • Warburton Holiday Park • Warrior Spirit Adventures	• Glen Cromie Reserve	• Atlas Ecology Pty Ltd • Blackbird Cruises	• Camp Sunnystones
Recreational users	• Kirinari Kayak Club • Paddle Victoria • Patterson Lakes Canoe Club • Victorian Sea Kayak Club • VRFish • Whitehorse Canoe Club Inc.	• VRFish	• VRFish	• VRFish • Werribee & District Anglers Club
Technical experts	• Aquatic Pollution Prevention Partnership • Arthur Rylah Institute • Australian Platypus Conservancy • Cesar Australia • Melbourne Water subject matter experts • Research collaborators at Melbourne University	• Aquatic Pollution Prevention Partnership • Arthur Rylah Institute • Australian Platypus Conservancy • Cesar Australia • Melbourne Water subject matter experts • Research collaborators at Melbourne University	• Aquatic Pollution Prevention Partnership • Arthur Rylah Institute • Australian Platypus Conservancy • Cesar Australia • Melbourne Water subject matter experts • Research collaborators at Melbourne University	• Aquatic Pollution Prevention Partnership • Arthur Rylah Institute • Australian Platypus Conservancy • Cesar Australia • Melbourne Water subject matter experts • Research collaborators at Melbourne University

	Yarra system	Tarago system	Maribyrnong system	Werribee system
Traditional Owners	• Gunaikurnai Land and Waters Aboriginal Corporation • Taungurung Land and Waters Council Aboriginal Corporation • Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation	• Bunurong Land Council Aboriginal Corporation • Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation	• Bunurong Land Council Aboriginal Corporation • Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation	• Bunurong Land Council Aboriginal Corporation • Wadawurrung Traditional Owners Aboriginal Corporation • Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation

Integrated catchment management

Altered water regimes are one of many threats to the health of Victoria's waterways. Many of the environmental objectives of water for the environment in the central region are complemented by simultaneously addressing issues such as barriers to fish movement, high nutrient loads, loss of streambank vegetation and invasive species.

Victorian and Commonwealth government agencies, Traditional Owner groups, community groups and private landholders implement programs to protect and improve the environmental condition and function of land, soils and waterways throughout Victoria's catchments.

Examples of complementary programs that support the outcomes of environmental flows in the central region include:

- works to protect and enhance streambanks along priority reaches, including willow removal, revegetation and fencing to exclude stock
- urban billabong restoration along the lower Yarra River using Western and Traditional Owner ecological knowledge
- an update to the Werribee Diversion Weir (proposed in the *Central and Gippsland Regional Sustainable Water Strategy*) to improve fish passage and delivery of environmental flows.

For more information about integrated catchment management programs in the central region, refer to the Corangamite CMA and Melbourne Water regional catchment strategies, the Melbourne Water *Healthy Waterways Strategy* and the *Corangamite Waterway Strategy*.

Risk management

When developing seasonal watering proposals for the Yarra, Tarago, Maribyrnong, Werribee, Moorabool and Barwon systems, environmental watering program partners assessed risks associated with potential environmental flows for 2024-25 and identified appropriate mitigating strategies. Risks and mitigating actions are continually assessed by program partners throughout the year (see **subsection 1.2.7**).

Seasonal outlook 2024-25

Total rainfall across the central region in 2023-24 was slightly below the long-term average but was highly variable between seasons. All systems had below-average rainfall between July and September 2023, with the Werribee, Moorabool and Barwon systems receiving their lowest September rainfall on record. October, December and January were all much wetter than average, but drier conditions returned in February 2024, and parts of the Barwon, Moorabool, Werribee and Maribyrnong systems experienced the lowest March rainfall on record. Wet conditions in previous years meant all storages across the central region were near-full. Tarago Reservoir spilled continuously from July 2023 to February 2024, and Melton Reservoir spilled from August to October and December to January. Lal Lal Reservoir peaked at 99.5 per cent in September 2023 but did not spill. The VEWH purchased water from licence holders in the Maribyrnong system to deliver environmental flows in Jacksons Creek.

The Bureau of Meteorology has forecast below-median rainfall and above-median temperatures during winter 2024 across the central region, but storage levels remain high, so all environmental entitlements are expected to receive close to full allocations in 2024-25. Forecast available supply in the Yarra, Tarago and Werribee systems should be sufficient to deliver the planned potential environmental watering actions in all climate scenarios to build on environmental outcomes achieved over recent wet years.

A near-full Rosslynne Reservoir will likely create an opportunity to purchase water to deliver environmental flows in the Maribyrnong system. However, outcomes in upper Jacksons Creek continue to be limited by infrastructure delivery constraints.

Options for delivering water for the environment in the Moorabool and Barwon systems in 2024-25 will be heavily influenced by local climatic conditions due to their smaller and more variable environmental allocations. Greater flows in the Moorabool and upper Barwon systems rely on significant contributions from local rainfall and are, therefore, only likely to be achieved in average or wet climatic conditions. Natural inflows will also have a significant bearing on the low flows and freshes in the Moorabool and upper Barwon systems, and summer and autumn flows may need to be delivered at the lower end of their recommended range to conserve available environmental supply if those seasons are dry. Delivery of water for the environment in the lower Barwon wetlands is not affected by annual allocations of water for the environment, and the proposed fill in winter/spring and partial drawdown in summer/autumn should be possible in all climate scenarios if river levels allow.

3.2 Yarra system

Waterway manager – Melbourne Water

Storage manager – Melbourne Water

Environmental water holder – Victorian Environmental Water Holder

The Yarra system includes *Birrarung* (Yarra River), the Plenty River and Yarra Billabongs.

System overview

***Birrarung* (Yarra River) flows west from the Yarra Ranges above Warburton through the Yarra Valley and then opens out into a wider plain as it meanders through the suburbs and city of Melbourne before entering Port Phillip Bay (Figure 3.2.1). Over time, the Yarra River below Warrandyte has been straightened, widened and cleared of fallen trees and other natural habitat features as Melbourne has developed.**

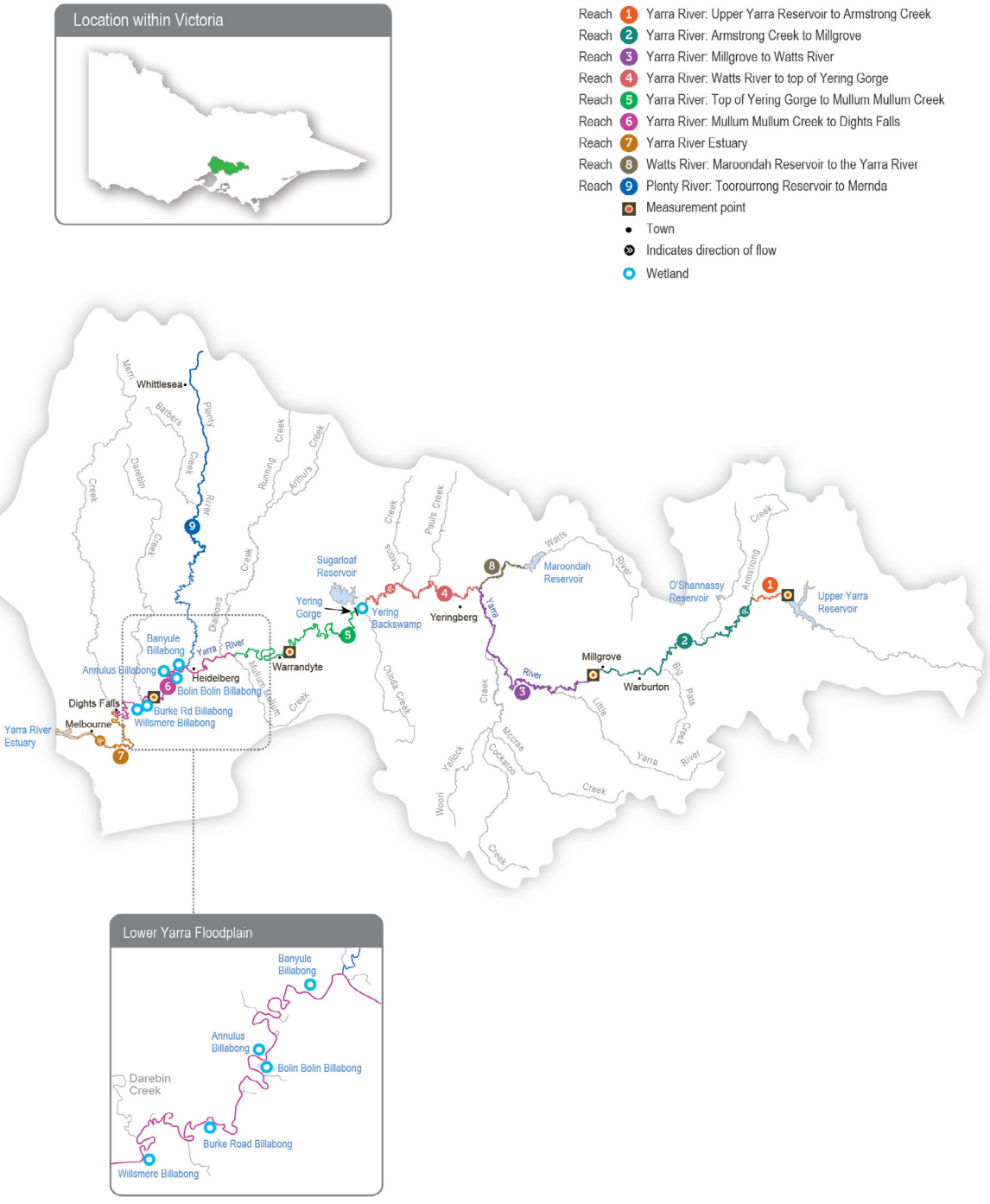
Up to 400,000 ML per year (long-term average diversion limit) can be harvested from the Yarra system for consumptive use in Melbourne and surrounding areas. The Upper Yarra, O'Shannassy and Maroondah reservoirs harvest water from headwater tributaries, and a pump station at Yering Gorge is used to harvest water from the Yarra River to Sugarloaf Reservoir.

Tributaries, including Armstrong Creek, McMahons Creek, Starvation Creek, Woori Yallock Creek and the Watts and Little Yarra rivers, influence the flow in the upper reaches of the Yarra River. Urbanised tributaries (such as Olinda Creek, Mullum Mullum Creek, Diamond Creek, Plenty River and Merri Creek) provide additional water to the middle and lower reaches of the Yarra River.

Water for the environment can be released from the Upper Yarra, Maroondah and O'Shannassy reservoirs to support environmental processes and outcomes in downstream river reaches and wetlands. Requests can also be made to cease harvest from the Yarra River at the Yering Gorge Pumping Station, allowing the flow to pass down the whole river system. The priority Yarra River reaches for environmental watering are 2 and 5, shown in **Figure 3.2.1**. Reach 6 is also a priority in summer and autumn to manage poor water quality upstream of Dights Falls, as flow targets in reach 5 may not be sufficient. Water for the environment delivered to reaches 2 and 5 will help meet flow targets in other reaches. Occasionally, watering actions met naturally in reaches 2 and beyond are not achieved in reach 1 due to the lack of unregulated tributary inflows immediately downstream of Upper Yarra Reservoir. In those cases, water for the environment can be used to meet flow targets in reach 1.

The Plenty River rises from the slopes of Mount Disappointment in the Great Dividing Range about 50 km north of Melbourne. It flows downstream through rural and semi-rural areas and Plenty Gorge before joining the Yarra River near Viewbank, east of Banyule Flats Reserve. Yan Yean Reservoir is located off the waterway north of Plenty Gorge, and it receives a flow from Toorourrong Reservoir via a channel. The Plenty River has not received managed environmental flows before, but there may be opportunities to deliver water for the environment from Yan Yean Reservoir in the coming years.

Figure 3.2.1 The Yarra system



Environmental values

The upper reaches of the Yarra River (reaches 1-3) have good-quality streamside and aquatic vegetation and provide habitat for native fish species, including river blackfish, mountain galaxias and common galaxias. The middle and lower reaches of the Yarra River (reaches 4-6) flow through forested gorges, cleared floodplains and some highly urbanised areas, and they support the native fish population, including Australian grayling, river blackfish, Macquarie perch and tupong. Macquarie perch were introduced to the Yarra River last century, and its population is now considered one of Victoria's largest and most important.

The Plenty River (reach 9) provides habitat for waterbugs and native fish species (such as common galaxias). Platypus have been detected in the Plenty River in the past, but none were recorded in recent surveys.

Billabongs are an important feature of the lower Yarra River floodplain between Heidelberg and Dights Falls and further upstream near Yarra Glen and Woori Yallock. The billabongs support distinct vegetation communities and provide foraging and breeding habitat for waterbirds and frogs. Except in times of high flow, most billabongs are disconnected from the Yarra River.

Environmental objectives in the Yarra system

	A1 – Maintain the frog population, particularly on the mid-Yarra River floodplain
	**CN1** – Provide sufficient rates of carbon and nutrient production and processing to support native fish and waterbug communities
	F1 – Protect and increase the native fish population, including threatened species (such as the Australian grayling, Macquarie perch and river blackfish)
	**G1** – Maintain the form of the river channel **G2** – Scour silt from riffles and clean cobbles
	**M1** – Maintain the diversity and increase the abundance of waterbugs to support aquatic food webs
	**PR1** – Maintain the resident platypus population
	**V1** – Maintain native streamside and aquatic vegetation on the riverbank and in the channels **V2** – Increase the growth of threatened wetland plant species to rehabilitate shallow marsh, deep marsh and freshwater meadows on the floodplain and billabongs
	WQ1 – Improve water quality in river pools, ensuring adequate oxygen concentration in the water to support fish, crustaceans and waterbugs

Traditional Owner cultural values and uses

Melbourne Water is working with the Registered Aboriginal Parties (RAPs) within the Yarra River (*Birrarung)* system — the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation and the Bunurong Land Council Aboriginal Corporation — as well as the Taungurung Land and Waters Council Aboriginal Corporation and Gunaikurnai Land and Waters Aboriginal Corporation, from whose Country water is diverted to the *Birrarung* system. The work is to develop and strengthen relationships and increase Traditional Owner involvement in the planning and delivery of water for the environment.

Melbourne Water is in discussions with each of the Traditional Owner corporations towards developing overarching partnership agreements, with formal partnership agreements already signed with Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) and Wadawurrung Traditional Owners Aboriginal Corporation. A key priority within GLaWAC's partnership agreement is how Melbourne Water could recognise Gunaikurnai water is leaving Country. In terms of environmental water management, the intent is for Traditional Owners of the *Birrarung* (Yarra River), and its tributaries, including the Plenty River, to be active partners in the planning, delivery and monitoring of all deliveries of water.

The part of the lower *Birrarung* floodplain included in the environmental watering program is on Wurundjeri Woi wurrung Country upstream of Chandler Highway. The parts of the lower *Birrarung* floodplain on Bunurong Country are not currently in the environmental watering program. Wallaby Creek on Taungurung Country is connected to the Plenty River catchment via Yan Yean Reservoir and is also not currently in the environmental watering program.

In 2021 Registered Aboriginal Party (RAP) determinations saw the lower *Birrarung* from just upstream of Moonee Ponds Creek to Port Phillip Bay included in the Bunurong Land Council Aboriginal Corporation's RAP boundaries. The Bunurong Land Council Aboriginal Corporation is working with the Bunurong people to determine the cultural objectives for the *Birrarung* on Bunurong Country.

Where possible, Melbourne Water and the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation work together to link water for the environment on the lower *Birrarung* floodplain with cultural outcomes for the Wurundjeri Woi wurrung people. Environmental water management on the lower Birrarung floodplain generally aligns with a landscape-scale approach for billabong watering, developed in consultation with the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation.

The management of water for the environment (including wetting and drying) at many billabongs in lower *Birrarung* (such as Annulus, Banyule and Bolin Bolin billabongs) is closely aligned with Wurundjeri Woi wurrung aspirations.

Increasing the involvement of Traditional Owners in environmental water management and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Victorian Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, ***Water for Victoria 2016***, the ***Central and Gippsland Region Sustainable Water Strategy 2022***, and ***Water is Life: Traditional Owner Access to Water Roadmap 2022***.

Where Traditional Owners are more deeply involved in the planning and/or delivery of environmental water for a particular site, their contribution is acknowledged in **Table 3.2.1** with an icon (as explained in **Figure 1.2.3**). The use of this icon is not intended to indicate that these activities are meeting all the needs of Traditional Owners but is used in the spirit of valuing that contribution.

Watering planned and/or delivered in partnership with Traditional Owners to support cultural values and uses

There are many places of tangible and intangible cultural significance for the Wurundjeri Woi wurrung people and the Bunurong people on the lower *Birrarung* floodplain.

A monitoring project continues at the billabongs with the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation's Narrap ('Country') Unit, the University of Melbourne and Melbourne Water. The group has been monitoring vegetation, birds, eels and water quality outcomes from environmental water and held an on-Country knowledge-sharing day in 2023 to discuss their learnings. Activities like these enable the Narrap Unit to build capacity to inform environmental water delivery to Wurundjeri Woi Wurrung Country.

The intent is to further the role and leadership of the Wurundjeri Woi wurrung people in managing the billabongs, including vegetation management, research and being partners in decision-making processes.

In 2024-25, filling Bolin Bolin Billabong in the average and wet scenarios will provide an exit

strategy for eels that have entered the billabong while connected with the Yarra River (*Birrarung*). The Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation Water Unit suggested this watering action to support the landscape-scale approach to watering floodplain billabongs. The Narrap Unit will collaborate on Bolin Bolin billabong water delivery and monitoring, depending on the unit's availability in 2024-25.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 3.2.1**, Melbourne Water considered how environmental flows could support values and uses, including:

- water-based recreation (such as kayaking, canoeing, fishing and swimming)
- riverside recreation and amenity (such as birdwatching, camping, picnicking, cycling, running and walking)
- community events and tourism (such as the Moomba Festival and the Inflatable Regatta)
- socioeconomic benefits (such as for diverters for irrigation, stock needs and domestic use: water levels and water quality can rely on the delivery of water for the environment, particularly in summer).

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of environmental water in Victoria.

Table 3.2.1 describes the potential environmental watering actions in 2024-25, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 3.2.1 Yarra system potential environmental watering actions, expected effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Yarra River – reach 1		
Winter/spring high flow (one high flow for three days during June-September) reach 1: 300 ML/d	• Scour sediment and biofilm from gravel in riffles • Provide prolonged wetting to favour flood-tolerant streamside native vegetation • Draw in and transport organic material to support carbon cycling	CN1, V1, G2
Yarra River – reach 2 and 5		
Winter/spring low flow (June to November) reach 2: 80-350 ML/day reach 5: 350-750 ML/day	• Physically mix pools to minimise the risk of stratification and low oxygen • Maintain access to habitats for fish, waterbugs and platypus • Wet bank vegetation to promote growth	F1, MI1, PR1, V1, WQ1

Potential environmental watering action	Expected watering effects	Environmental objectives
Winter/spring freshes (two freshes for three to seven days during June to September) reach 2: 700 ML/day reach 5: 1,300-2,500 ML/day	• Scour sediment and biofilm from gravel in riffles to improve spawning opportunities for Macquarie perch • Wet native streamside vegetation on the banks of the river to promote growth • Provide cues for upstream migration of juvenile migratory fish (e.g. Australian grayling and tupong) and spawning of Macquarie perch • Draw in and transport organic material to support carbon cycling	
Spring high flow (one high flow for 14 days during September to October) reach 2: 700 ML/day reach 5: 2,500 ML/day	• Scour sediment and biofilm from gravel in riffles • Provide prolonged wetting to favour flood-tolerant native vegetation in the streamside zone • Provide cues for upstream migration of juvenile migratory fish (e.g. Australian grayling and tupong) • Improve spawning opportunities of Macquarie perch • Draw in and transport organic material to support carbon cycling	
Summer/autumn low flow (December to May) reach 2: 80 ML/day reach 5: 200 ML/day reach 6: 300-450 ML/day	• Physically mix pools to minimise the risk of stratification and low oxygen • Maintain riffle and pool habitats for fish, waterbugs and platypus	
Summer/autumn freshes (three freshes for two days during December to May) reach 2: 350 ML/day reach 5: 750 ML/day	• Flush pools to prevent a decline in water quality • Scour sediment and biofilm from gravel in riffles and pools to maintain habitat quality for fish and waterbugs • Provide opportunities for the localised movement of fish and platypus • Wet the banks of the river to maintain flood-tolerant vegetation on the banks	
Autumn high flow (one high flow for seven to 14 days during April to May) reach 2: 560 ML/day reach 5: 1,300 ML/ day	• Cue the migration of Australian grayling • Scour sediment and biofilm from gravel in riffles and pools to maintain habitat quality for fish and waterbugs	

Potential environmental watering action	Expected watering effects	Environmental objectives
Yarra Billabongs		
Bolin Bolin Billabong (fill in spring)	• Fill the wetland to full supply level to engage the inlet/outlet channel to the Yarra River as an exit strategy for eels • Allow to draw down over summer and autumn to support the growth of threatened wetland plant species and encourage the regeneration of spreading aquatic herbs • Maintain a permanent pool to provide habitat for frogs, waterbugs and any remaining eels • Provide an exit for eels to return to the Yarra	
Yering Backswamp (fill in autumn/winter/spring)	• Wet the deepest parts of the wetland to about 80 cm to provide habitat for frogs • Wet remaining areas of the wetland to about 40-60 cm to support the growth of threatened wetland plant species and encourage the regeneration of spreading aquatic herbs	

Scenario planning

Table 3.2.2 outlines potential environmental watering and expected water use in various planning scenarios.

In the Yarra system, dry, average and wet planning scenarios are considered. A drought planning scenario for the Yarra has not been included as the actions would be almost identical to the dry planning scenario and because drought conditions don't normally affect the allocation of water for the environment.

The Yarra system has received above-average inflows for each of the last four years, which has resulted in all planned environmental watering actions being met or exceeded. Recent monitoring and anecdotal observations indicate that the wetter conditions have supported Australian grayling recruitment. Recruits have been found in each of the last two years, the first confirmed records of recruitment since targeted monitoring began in 2018-19. The conditions have also helped increase the abundance of Macquarie perch and improved the health of vegetation communities within and surrounding billabongs. Environmental watering actions planned for 2024-25 aim to maintain and, where possible, enhance the environmental gains observed in recent years.

Yarra River

The environmental watering priority for the Yarra River in all planning scenarios is to deliver a low flow in the recommended range and small-to-medium freshes in reaches 2 and 5 throughout the year to maintain high-quality habitat for native fish, platypus and macroinvertebrates and flow variability in the lower parts of the channel to facilitate fish dispersal and water fringing vegetation. The extent to which the flow is likely to be met by natural tributary inflows varies in the dry, average and wet planning scenarios, and water for the environment will be used to fill the main deficits in each planning scenario, where possible.

In the average and wet planning scenarios, the autumn high flow is a high priority to trigger Australian grayling to migrate downstream to the estuary to spawn. Australian graylings live for about three to four years and require spawning opportunities in two out of every three years to sustain healthy populations. Delivering this flow is always a high priority in average and wet years and will ensure that spawning is cued to other appropriate conditions in the landscape. It is also a high priority in dry years if it hasn't been delivered in the preceding one or two years. Although an autumn high flow has occurred in each of the last four years, Melbourne Water may still deliver one in 2024-25 in the dry planning scenario if there is sufficient supply or to piggyback on a natural event.

Lower-priority actions for the Yarra River in 2024-25 include the winter/spring high flow in reach 1, which may be delivered in any planning scenario and the spring high flow targeting reaches 2 and 5, which may be delivered in the average or wet planning scenarios. The winter/spring high flow in reach 1 is not required in 2024-25, given that the high flow in the last four years has mobilised sediments and prevented terrestrial vegetation from encroaching on the stream channel. The spring high flow for reaches 2 and 5 has the same magnitude as the winter/spring fresh in those reaches but has a longer recommended duration to drown out terrestrial vegetation growing on the banks and encourage the growth of flood-tolerant native plant species. Recent monitoring suggests that the spring high flow has a negligible effect on plants growing on the water's edge and is, therefore, a lower priority to deliver in 2024-25. It may be delivered in average or wet conditions to further assess its effect with a view to potentially modifying the recommendation in future, but it will only be delivered if supply is available and suitable monitoring is in place.

Yarra Billabongs

Given recent wet conditions, all billabongs filled naturally in 2023-24, and most will be allowed to draw down naturally to provide foraging habitat for birds and other animals to support important dry-phase ecosystem processes. Watering of Yering Backswamp is a high priority in all planning scenarios in 2024-25. The distinct vegetation community at Yering Backswamp has adapted to frequent or near-permanent inundation at given times. As such, it is the only managed wetland on the Yarra floodplain that is actively watered every year. Filling of Bolin Bolin Billabong is identified as a high priority in the average and wet planning scenarios to allow short-finned eels that are currently in the billabong to move into the main river channel and migrate to the Coral Sea to spawn. Members of the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation Water Unit suggested this watering action. Tagged eels and acoustic monitoring will help the Arthur Rylah Institute for Environmental Research determine the likelihood of eels being trapped when the billabong is disconnected from the river.

A carryover target of 11,000 ML has been set for the dry planning scenario to ensure sufficient supply in 2025-26 to deliver an autumn high flow if it isn't delivered in 2024-25.

Table 3.2.2 Yarra system environmental watering planning scenarios

Planning scenario	Dry	Average	Wet
Expected conditions	• Low streamflow year-round • Lack of unregulated freshes and high flow • Passing flow is not likely to meet the minimum environmental flow recommendations • Potential poor water quality, particularly in summer • Pools may stratify	• Low-flow recommendations are likely to be met by passing flow • Natural flow may provide some freshes, but its duration and/or magnitude will likely be less than the recommended environmental flow • Potentially poor water quality, particularly in summer • Pools may stratify • Small reservoirs may spill • Overbank flow is not likely, although some billabongs may engage in the lower reaches	• Low-flow recommendations are likely to be met by passing flow • High, natural flow will occur, most likely in winter/spring • Major spills from reservoirs may occur • Most billabongs are likely to fill naturally

Planning scenario	Dry	Average	Wet
Expected availability of water for the environment	• 37,400 ML	• 37,400 ML	• 37,400 ML
Potential environmental watering – tier 1 (high priorities)	**Tier 1a (can be achieved with predicted supply)**		
	• Winter/spring low flow • Winter/spring freshes (two freshes) • Summer/autumn low flow • Summer/autumn freshes (three freshes) • Billabong watering (Yering Backswamp)	• Winter/spring low flow • Winter/spring freshes (two freshes) • Summer/autumn low flow • Summer/autumn freshes (three freshes) • Autumn high flow (one high flow) • Billabong watering (Bolin Bolin Billabong and Yering Backswamp)	• Winter/spring low flow • Winter/spring freshes (two freshes) • Summer/autumn low flow • Summer/autumn freshes (three freshes) • Autumn high flow (one high flow) • Billabong watering (Bolin Bolin Billabong and Yering Backswamp)
	Tier 1b (supply deficit)		
	• Autumn high flow (one high flow)		
Potential environmental watering – tier 2 (additional priorities)	• Winter/spring high flow (reach 1)	• Winter/spring high flow (reach 1) • Spring high flow (one high flow)	• Winter/spring high flow (reach 1) • Spring high flow (one high flow)
Possible volume of water for the environment required to achieve objectives	• 25,900 ML (tier 1a) • 11,600 ML (tier 1b) • 1,400 ML (tier 2)	• 20,550 ML (tier 1a) • 0 ML (tier 1b) • 8,400 ML (tier 2)	• 5,950 ML (tier 1a) • 0 ML (tier 1b) • 3,900 ML (tier 2)
Priority carryover requirements for 2025-26	• 11,000 ML		

3.3 Tarago system

Waterway manager – Melbourne Water

Storage manager – Melbourne Water

Environmental water holder – Victorian Environmental Water Holder

System overview

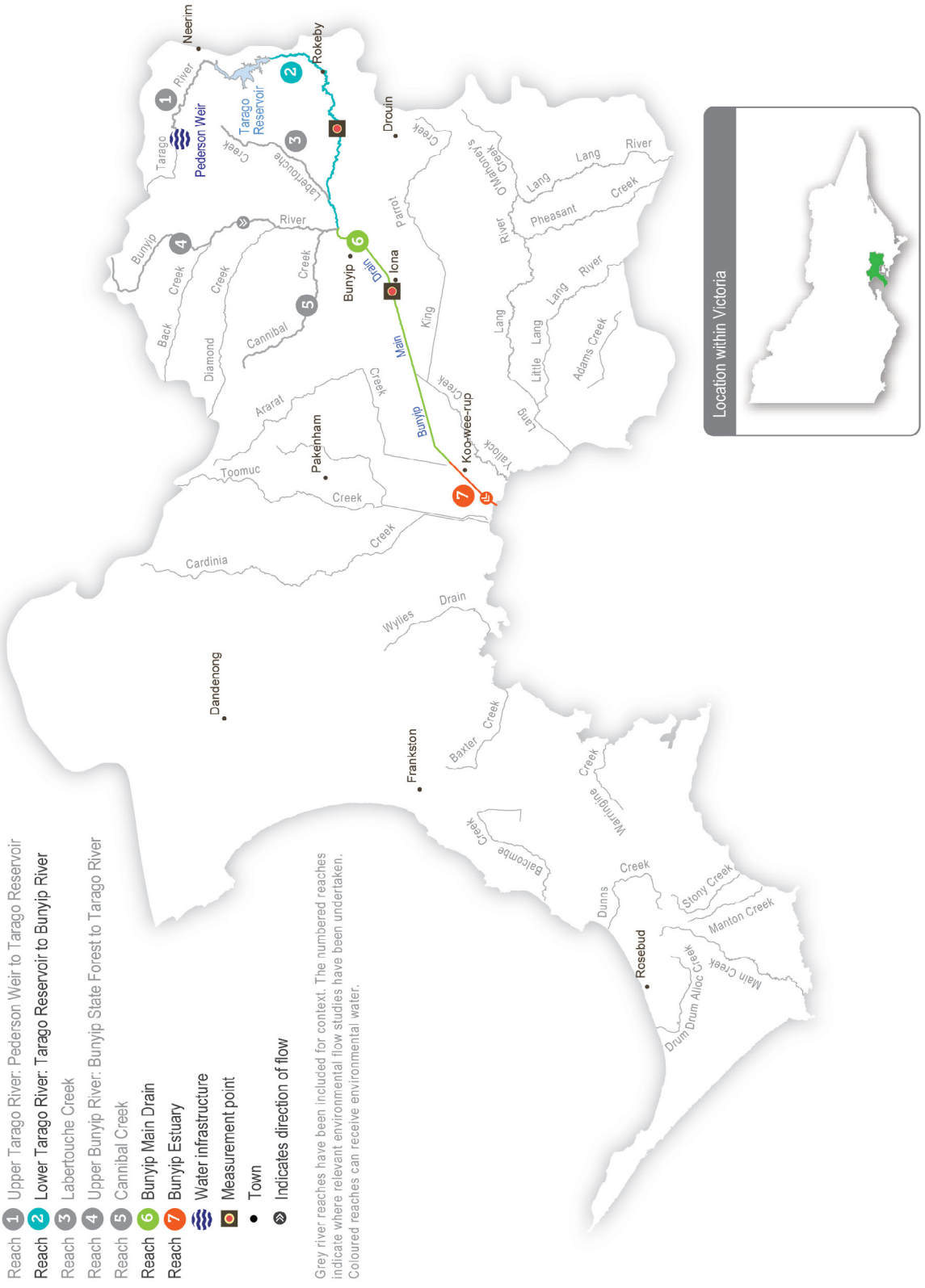
The Tarago River rises in the Tarago State Forest and flows into the Tarago Reservoir at Neerim (Figure 3.3.1). The reservoir harvests inflows from all upstream tributaries to supply towns on the Mornington Peninsula and around the Western Port area. Water is released from the reservoir to supply downstream irrigators. Below the reservoir, the Tarago River flows close to Rokeby before meeting the Bunyip River at Longwarry North. From there, the Bunyip River flows through a modified, straightened channel called Bunyip Main Drain that discharges into Western Port. The Bunyip Main Drain supplies many irrigators in the catchment.

Water available under the *Tarago and Bunyip Rivers Environmental Entitlement 2009* is stored in and released from Tarago Reservoir. This water is primarily used to meet environmental objectives in reach 2, between the reservoir and the confluence of the Tarago and Bunyip rivers, as **Figure 3.3.1** shows. Water for the environment delivered to reach 2 also supports environmental flow recommendations in reach 6 (Bunyip Main Drain).

Year-round passing flows in the Bunyip and Tarago rivers are stipulated under both the environmental entitlement and Melbourne Water's bulk entitlement. These passing flows contribute toward meeting the minimum low-flow requirements in summer/autumn and winter/spring, but they are less than the recommended minimum flows. The passing flows do not provide any of the freshes or greater flows that are needed throughout the year to support environmental outcomes.

Water released to meet irrigation demands can create variable flow patterns in the Tarago and Bunyip rivers throughout the year. The magnitude and timing of these releases can influence environmental outcomes, and Melbourne Water continues to work with Southern Rural Water to optimise the shared value derived from irrigation releases.

Figure 3.3.1 The Tarago system



Environmental values

The Tarago system contains several significant and threatened native animal and plant species, including Australian grayling. The upper catchment (reach 2) has healthy streamside vegetation and diverse in-stream habitat that supports platypus and native fish, including river blackfish, tupong, short-finned eels and mountain galaxias. The lower catchment (reach 6) has been highly modified but still contains patches of remnant vegetation and is a key migration pathway for Australian grayling. It also has healthy platypus populations.

Environmental objectives in the Tarago system

	F1 – Increase the native fish populations, including threatened species (such as Australian grayling)
	**G1** – Maintain channel form and structure
	**MI1** – Increase the diversity and biomass of waterbugs to support aquatic food webs
	**PR1** – Increase the platypus population
	**V1** – Increase native streamside and aquatic plant communities on the riverbank and in the channel
	WQ1 – Improve water quality in river pools, ensuring adequate oxygen concentration in the water to support fish, crustaceans and waterbugs

Traditional Owner cultural values and uses

Melbourne Water is working with the Registered Aboriginal Party (RAP) within the Tarago system — the Bunurong Land Council Aboriginal Corporation — and other interested Traditional Owner groups to develop and strengthen relationships and increase Traditional Owner involvement in the planning and delivery of water for the environment.

Partnership agreements have been finalised between Melbourne Water and two RAPs within the Port Phillip and Westernport region framing relations and obligations between the organisations. Discussions with the Bunurong Land Council Aboriginal Corporation will determine whether a similar partnership agreement would benefit Bunurong. The intent is for Traditional Owners to be active partners in planning, delivering and monitoring water for the environment associated with the Tarago and Bunyip rivers.

There are more opportunities for Melbourne Water and the VEWH to work with Traditional Owner groups to identify and integrate cultural values and their flow requirements into the environmental watering program on an ongoing basis. During development of the seasonal watering proposal, Melbourne Water met with staff from Bunurong Land Council Aboriginal Corporation to discuss how environmental watering can support Traditional Owners' cultural objectives and identify opportunities to use environmental water to support these. The Bunurong Land Council Aboriginal Corporation has expressed a desire to be more involved in environmental flow planning and management in the Tarago River.

Melbourne Water and the VEWH will continue to work with the Traditional Owner groups to identify and integrate cultural values and their flow requirements into the environmental watering program on an ongoing basis.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria,*** the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 3.3.1**, Melbourne Water considered how environmental flows could support values and uses, including:

- water-based recreation (such as fishing and swimming)
- riverside recreation and amenity (such as cycling, camping, caravanning, short- and long-term visiting and walking)
- community events and tourism (such as visiting and residing in the Glen Cromie Reserve caravan park)
- socioeconomic benefits (such as for diverters for irrigation, stock needs and domestic use: water levels and water quality can rely on the delivery of water for the environment, particularly in summer).

Planned environmental flows may be modified to align with a community benefit so long as environmental outcomes are not compromised. Melbourne Water may time the release of a summer fresh in the Tarago River to coincide with long weekends in January or March, so visitors and residents of the Glen Cromie Reserve caravan park can enjoy the increased flow in the river. This would also benefit social and recreational uses along the many public areas on the river, which is acknowledged in **Table 3.3.1** with an icon (as explained in **Figure 1.2.3**).

Watering planned to support peaks in visitation (e.g. camping or other public activities on long weekends or school holidays)

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of environmental water in Victoria.

Table 3.3.1 describes the potential environmental watering actions in 2024-25, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 3.3.1 Tarago system potential environmental watering actions, expected effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Tarago River (targeting reach 2)		
Winter/spring low flow (75 ML/day or natural during June to November)	• Prevent the encroachment of terrestrial vegetation in the channel • Wet the banks to promote the growth of streamside vegetation • Maintain an adequate depth through riffles to allow access to habitats for fish and platypus • Mix pools to maintain water quality and increase habitat for fish and macroinvertebrates during wetter months	F1  MI1  PR1  V1

Potential environmental watering action	Expected watering effects	Environmental objectives
Winter/spring fresh(es) (one to two freshes with a peak of 100-200 ML/day for two days during June to September)	• Flush sediment and scour biofilm from stream substrate and large woody debris to maintain habitat for macroinvertebrates and fish, including river blackfish • Create extra depth to allow greater fish movement between pools and reaches • Cue the downstream migration of species, including eel and tupong • Wet the banks and low benches to maintain the fringing aquatic vegetation	F1, MI1, V1
Spring high flow (one high flow with a peak of 200-300 ML/day for two days in a seven-to-10-day duration during September to October)	• Form and maintain scour holes around large wood • Prevent the encroachment of terrestrial vegetation into the channel • Cue the upstream migration of juvenile diadromous fish (e.g. Australian grayling) from the sea or estuary into the river • Wet the higher benches to maintain the fringing aquatic vegetation and ensure vertical zonation of the fringing vegetation • Encourage female platypus to select a nesting burrow higher up the bank to reduce the risk of greater flow later in the year flooding the burrow when juveniles are present	F1, G1, PR1, V1
Summer/autumn low flow (20 ML/day or natural during December to May)	• Maintain adequate depth through riffles to support waterbugs and allow access to habitats for fish and platypus • Maintain adequate foraging habitat in pools for fish and platypus • Maintain water quality (especially oxygen concentration) in pools	F1, MI1, PR1, WQ1
Summer/autumn freshes (three to five freshes of 75 ML/day for two days during December to May)	• Flush fine silt from hard substrates and around large woody debris to maintain habitat for native fish in low-flow periods • Allow the localised movement of native fish • Prevent terrestrial vegetation growth on sandbars • Maintain water quality by aeration in times of low flow	F1, V1, WQ1
Autumn high flow (one high flow with a peak of 100 ML/day for two days in a minimum seven-day duration during April to May)	• Cue the downstream migration and spawning of diadromous fish (e.g. Australian grayling) • Assist the dispersal of juvenile platypus	F1, PR1

Scenario planning

Table 3.3.2 outlines potential environmental watering and expected water use in a range of planning scenarios.

The Tarago River generally requires similar watering actions every year, but the volume of its low flow and the frequency of its high flow are less in the drought and dry planning scenarios than in the wet or average planning scenarios. Natural catchment inflows, passing flow and reservoir spills will meet many of the required watering actions and provide natural-flow variation throughout the year, especially in the wet planning scenario. Water for the environment will be used where possible to deliver critical flow components not met by other means. Melbourne Water will monitor water levels and water quality throughout the year and adjust releases as necessary to limit stress on existing plants and animals.

The drought planning scenario would be triggered by a combination of the Bureau of Meteorology's reported El Niño status, below-average inflows to Tarago Reservoir and low streamflow projections. In the drought planning scenario, the passing flows and natural inflows are expected to meet the low-flow recommendation partially. Water for the environment will be used primarily in this planning scenario to deliver up to five summer/autumn freshes to regularly top up water levels and improve water quality to ensure native fish and platypus have adequate habitat and are not stressed for too long.

Passing flows and natural inflows are expected to meet a greater proportion of the recommended low flow in the dry, average and wet planning scenarios, and water for the environment will be used to deliver a combination of freshes and a high flow in those planning scenarios. Fewer summer/autumn freshes are planned in the dry planning scenario compared to the drought planning scenario because the low flow will be closer to the recommended level, and the available water supplies will be used to deliver a range of other flows throughout the year. Overall, the number of planned freshes and a high flow increases from the dry-to-wet planning scenarios to reflect natural hydrological conditions and to improve environmental outcomes by providing more food and better breeding opportunities for native fish and platypus.

An autumn high flow is needed to trigger Australian grayling movement and spawning. Australian graylings need favourable breeding conditions at least two of every three years to maintain and grow their population. Wet conditions have delivered a high autumn flow in the Tarago River in each of the last five years, so an additional flow is not essential in 2024-25. However, it will be delivered if the available supply can help consolidate the recent population increases. Winter/spring freshes are needed to cue and facilitate fish movement, including the downstream migration of tupong and eels, and to support the growth of new fringing vegetation. The dry planning scenario includes one winter/spring fresh to maintain the current condition of native fish populations and streamside vegetation, and the average and wet planning scenarios include extra freshes to enhance native fish and plant communities. The spring high flow may be delivered in the average and wet planning scenarios to water vegetation higher up the bank and cue the upstream migration of juvenile fish, including Australian grayling.

Seasonal inflows influence water supply in the Tarago system during the year, so carryover requirements vary significantly between planning scenarios. In the drought planning scenario, carrying over at least 400 ML at the end of 2024-25 will be important to ensure sufficient water for summer/autumn freshes in 2025-26. Carryover is a low priority in all other planning scenarios because allocations in 2025-26 will likely be sufficient to meet priority watering demands in that year.

Table 3.3.2 Tarago system environmental watering planning scenarios

Planning scenario	Drought[1]	Dry	Average	Wet
Expected conditions	• Very low streamflow • Reduction in passing flow • Increased surface water loss to groundwater • Irrigation releases likely	• Low streamflow • Some reduction in passing flow • Increased surface water loss to groundwater • Irrigation releases likely	• Average streamflow • Partial freshes naturally provided • Some irrigation releases likely	• Above-average streamflow • Partial or full freshes naturally provided • Irrigation releases unlikely • Tarago Reservoir spills
Expected availability of water for the environment	• 3,000 ML	• 3,500 ML	• 3,500 ML	• 3,000 ML
Tarago River (targeting reach 2)				
Potential environmental watering – tier 1 (high priorities)	**Tier 1a (can be achieved with predicted supply)**			
	• Summer/ autumn low flow • Summer/ autumn freshes (five freshes)	• Winter/spring low flow (partial compliance) • Winter/spring fresh (one fresh) • Summer/ autumn low flow • Summer/ autumn freshes (three freshes) • Autumn high flow	• Winter/spring low flow (partial compliance) • Winter/spring freshes (two freshes) • Spring high flow • Summer/ autumn low flow • Summer/ autumn freshes (five freshes) • Autumn high flow	• Winter/spring low flow • Winter/spring freshes (two freshes) • Spring high flow • Summer/ autumn low flow • Summer/ autumn freshes (five freshes) • Autumn high flow
	Tier 1b (supply deficit)			
	• Winter/spring low flow	• Winter/spring low flow	• Winter/spring low flow	
Potential environmental watering – tier 2 (additional priorities)	• Winter/spring fresh (one fresh) • Spring high flow • Autumn high flow	• Spring high flow	• N/A	• N/A

Planning scenario	Drought[1]	Dry	Average	Wet
Possible volume of water for the environment required to achieve objectives	• 3,000 ML (tier 1a) • 4,350 ML (tier 1b) • 1,550 ML (tier 2)	• 3,000 ML (tier 1a) • 2,835 ML (tier 1b) • 550 ML (tier 2)	• 3,500 ML (tier 1a) • 515 ML (tier 1b) • 0 ML (tier 2)	• 1,885 ML (tier 1a) • 0 ML (tier 1b) • 0 ML (tier 2)
Priority carryover requirements for 2025-26	• 400 ML	• 0 ML	• 0 ML	• 0 ML

1 The drought planning scenario was first added for 2023-24 to demonstrate target actions in conditions where the recommended watering actions for the dry planning scenario could not be met due to further reduced streamflow.

3.4 Maribyrnong system

Waterway manager – Melbourne Water

Storage manager – Southern Rural Water

Environmental water holder – Not applicable

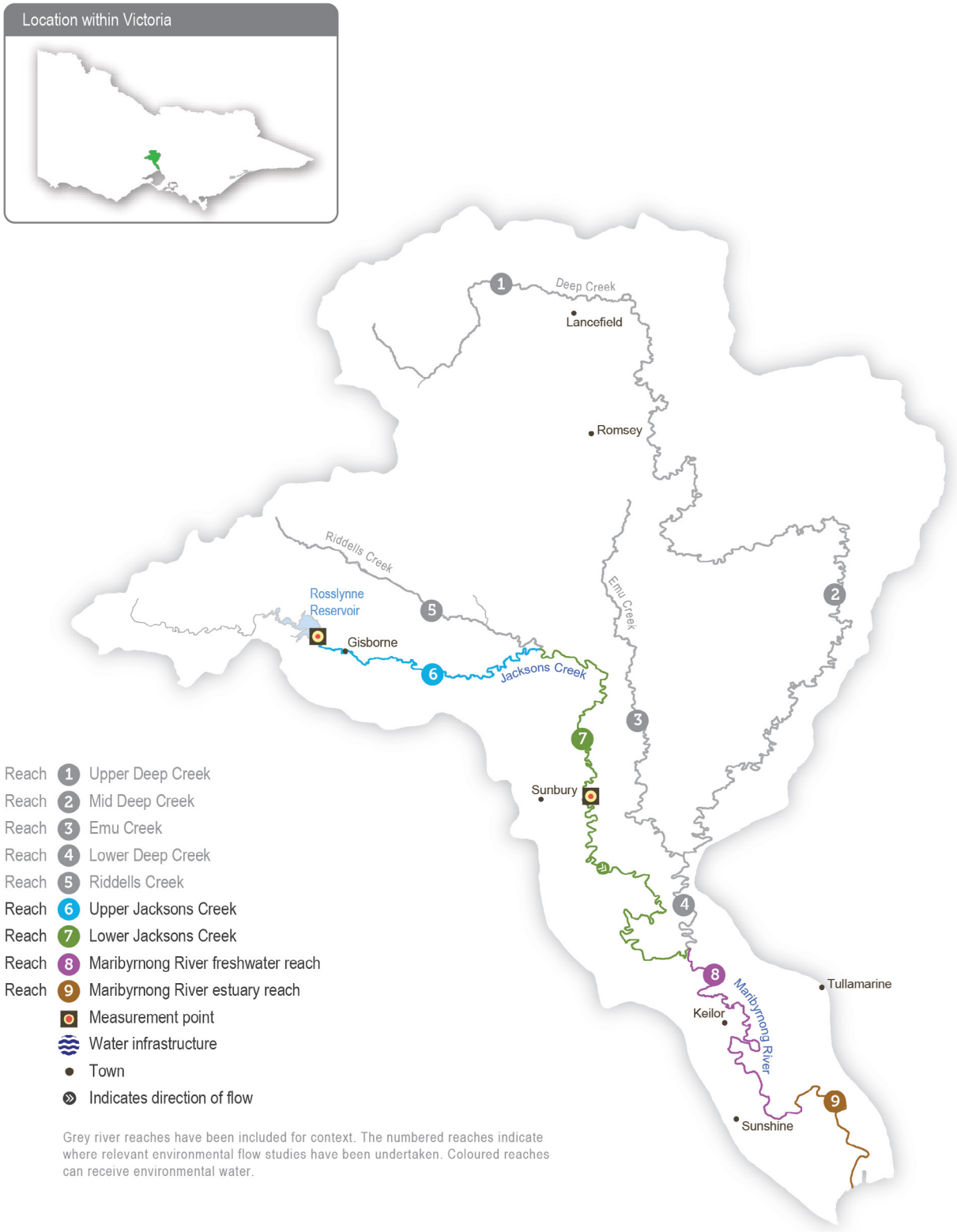
System overview

The Maribyrnong catchment is located to the northwest of Melbourne. The main waterways in the catchment are Jacksons Creek, which flows southeast from Mount Macedon, and Deep Creek, which flows south from Lancefield (Figure 3.4.1). These tributaries join at Keilor North to form *Mirrangbamurn* (Maribyrnong River), which flows south to join *Birrarung* (Yarra River) at Yarraville before flowing into Port Phillip Bay.

Rosslynne Reservoir is in the upper reaches of Jacksons Creek near Gisborne and is the only major storage in the Maribyrnong catchment. The reservoir has a maximum release capacity of 20 ML per day in ideal conditions, which significantly constrains the environmental outcomes that can be achieved in the Maribyrnong system. Water for the environment is primarily used to support environmental outcomes in Jacksons Creek between Rosslynne Reservoir and the confluence with Riddles Creek (that is, delivery of water for the environment to reach 6, as shown in **Figure 3.4.1**). Jacksons Creek is a known groundwater-dependent ecosystem on the national *Groundwater Dependent Ecosystems Atlas* and a priority groundwater-dependent ecosystem in the Melbourne Water groundwater-dependent ecosystem program. This means environmental components in the system rely on groundwater at least some of the time.

The VEWH does not hold an environmental entitlement in the Maribyrnong system, and it relies on opportunistic, temporary trade to meet demands. Melbourne Water (as diversion manager) and the VEWH work with local diversion licence holders to purchase unused water when it is available to support environmental outcomes. This arrangement is negotiated each year, is subject to water availability in the bulk entitlement and storage capacity, and only occurs with all parties' agreement.

Figure 3.4.1 The Maribyrnong system



Environmental values

The upper Maribyrnong catchment contains areas of intact streamside vegetation, which provide important habitat for native fish, including migratory short-finned eels, common and ornate galaxias, flathead gudgeon, tupong and Australian smelt.

A diverse and abundant waterbug community provides food for a significant platypus population in several reaches of the Maribyrnong system.

Environmental objectives in the Maribyrnong system

	F1 – Protect the native small-bodied fish population
	**MI1** – Support a wide range and high biomass of waterbugs to break down dead organic matter and support the river's food chain
	**PR1** – Protect the platypus population
	**V1** – Maintain the condition, abundance, diversity and structure of in-stream and streamside vegetation
	WQ1 – Maintain water quality, particularly oxygen concentrations

Traditional Owner values and uses

Melbourne Water is working with the Registered Aboriginal Parties (RAPs) within the Maribyrnong system — the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation and the Bunurong Land Council Aboriginal Corporation — to strengthen relationships and increase Traditional Owner involvement in the planning and delivery of water for the environment.

There are many opportunities for Melbourne Water and the VEWH to work with Traditional Owner groups to identify and integrate cultural values and their flow requirements into the environmental watering program on an ongoing basis.

When developing its seasonal watering proposal, Melbourne Water met with both the Wurundjeri Woi Wurring Cultural Heritage Aboriginal Corporation and Bunurong Land Council Aboriginal Corporation to discuss how environmental watering may support Traditional Owner cultural objectives and to identify opportunities. Due to the uncertainty about the volume of water that will be able to be secured via temporary trade in 2024-25 and the constraints in delivering environmental flows from Rosslynne Reservoir, there are currently limited opportunities to deliver water for the environment to support Traditional Owners to achieve objectives for water on Country.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria,*** the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 3.4.1**, Melbourne Water considered how environmental water could support social values (such as community connection and amenity) by planning flows that will maintain healthy habitat and improve water quality.

Opportunities for enhancing shared social, recreational and economic benefits through modification of environmental water deliveries are highly constrained by the volume of environmental water available and the outlet of Rosslynne Reservoir. Despite this, summer/autumn fresh releases may be made to coincide with public holiday long weekends (January 26 public holiday) when there are high levels of visitation at parks along Jacksons Creek at Gisborne and Sunbury. Increased flows will target delivery of shared benefits over these periods by improving amenity for park users and visitors to the waterway.

Planned environmental flows may be modified to align with a community benefit so long as environmental outcomes are not compromised.

The possibility of achieving shared benefits over the January 26 public holiday period is acknowledged in **Table 3.4.1** with an icon (as explained in **Figure 1.2.3**).

Watering planned to support peaks in visitation (e.g. camping or other public activities on long weekends or school holidays)

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of environmental water in Victoria.

Table 3.4.1 describes the potential environmental watering actions in 2024-25, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 3.4.1 Maribyrnong system potential environmental watering actions, expected effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Jacksons Creek (targeting reach 6)		
Winter/spring low flow (15 ML/day during June to November)	• Maintain depth in pools and riffles to provide habitat for small-bodied native fish, platypus and waterbugs • Prevent terrestrial vegetation encroachment	F1, MI1, PR1, V1
Summer/autumn low flow (4-6 ML/day during December to May)	• Maintain the availability of pool habitat for small-bodied fish and platypus during low-flow periods • Maintain a > 0.1 m median depth over riffles to provide macroinvertebrate habitat and inundate in-stream vegetation • Maintain continuous flow to limit pool stratification and maintain water quality	F1, MI1, PR1, V1, WQ1
Summer/autumn freshes (five freshes of 15 ML/day for four days every four to six weeks during December to May) 	• Increase depth over riffles to provide local movement of small-bodied native fish and platypus during the low-flow period • Maintain habitat and food resources for waterbugs • Flush pools to maintain water quality	F1, MI1, PR1, WQ1

Scenario planning

Table 3.4.2 outlines potential environmental watering and expected water use in a range of planning scenarios.

There is no permanent environmental entitlement in the Maribyrnong system, so water for the environment can only be delivered in 2024-25 if other entitlement holders are willing to sell some of their annual allocations to the VEWH.

An adequate low flow throughout the year and summer/autumn freshes are a high priority in all planning scenarios to maintain habitat for native fish and platypus and to prevent poor water quality. In the average and wet planning scenarios, local catchment run-off, tributary inflows and groundwater contributions will likely meet and exceed these requirements in lower Jacksons Creek (reach 7). However, in all planning scenarios, the mandated passing flow and water for the environment will be needed to achieve these watering actions in upper Jacksons Creek (reach 6).

The VEWH cannot carry over water in the Maribyrnong system to support multi-year planning.

Table 3.4.2 Maribyrnong system environmental watering planning scenarios

Planning scenario	Dry	Average	Wet
Expected river conditions	• Low volumes of unregulated flow • Passing flow may meet some low-flow objectives • Some baseflow from groundwater contributions in Jacksons Creek	• Unregulated flow meets some objectives • Passing flow may meet several low-flow objectives • Groundwater contributions provide baseflow in Jacksons Creek	• Unregulated flow meets most objectives • Passing flow may meet most low-flow objectives • Groundwater contributions provide baseflow in Jacksons Creek
Expected availability of water for the environment	• There is no environmental entitlement in the Maribyrnong system. Water will need to be traded with willing irrigators to support watering actions.		
Jacksons Creek (targeting reach 6)			
Potential environmental watering – tier 1 (high priorities)	**Tier 1a (can be achieved with predicted supply)**		
	• N/A		
	Tier 1b (supply deficit)		
	• Winter/spring low flow • Summer/autumn low flow • Summer/autumn freshes (five freshes)	• Winter/spring low flow • Summer/autumn low flow • Summer/autumn freshes (five freshes)	• Winter/spring low flow • Summer/autumn low flow • Summer/autumn freshes (five freshes)
Possible volume of water for the environment required to achieve objectives	• 0 ML (tier 1a) • 2,400 ML (tier 1b)	• 0 ML (tier 1a) • 2,400 ML (tier 1b)	• 0 ML (tier 1a) • 2,400 ML (tier 1b)

3.5 Werribee system

Waterway manager – Melbourne Water

Storage manager – Southern Rural Water

Environmental water holder – Victorian Environmental Water Holder

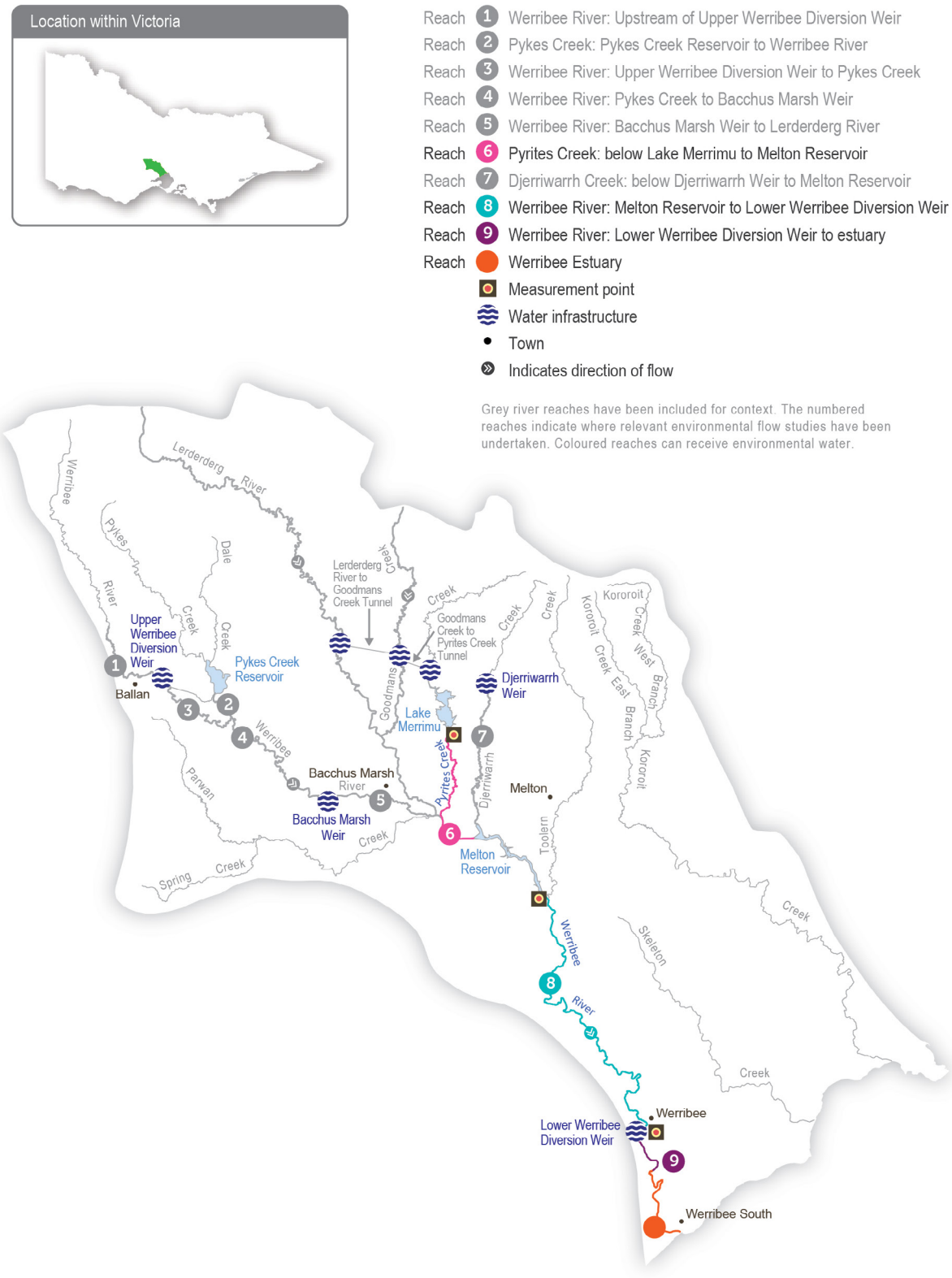
System overview

The Werribee River flows southeast from the Wombat State Forest near Ballan, through the Werribee Gorge to Bacchus Marsh and into Port Phillip Bay at Werribee (Figure 3.5.1). The Lerderderg River is a major tributary that joins the river at Bacchus Marsh. The main storages in the Werribee system are Pykes Creek Reservoir, Melton Reservoir and Merrimu Reservoir.

The four reaches in the Werribee system that can receive water for the environment are Pyrites Creek between Lake Merrimu and Melton Reservoir (reach 6), the Werribee River between Melton Reservoir and the Werribee Diversion Weir (reach 8), Werribee River between the Werribee Diversion Weir and Werribee Park Tourism Precinct (reach 9) and the Werribee River estuary below the Werribee Park Tourism Precinct.

Environmental flows that target environmental objectives in reach 9 and the estuary are delivered from Melton Reservoir and therefore also benefit reach 8. Water for the environment released from Lake Merrimu is re-harvested in Melton Reservoir, where it can be held and released at an appropriate time to achieve environmental objectives in the lower Werribee River.

Figure 3.5.1 The Werribee system



Environmental values

The Werribee system supports a range of native fish, including Australian grayling, river blackfish, flathead gudgeon, short-finned eel, tupong, Australian smelt, several species of galaxiids and a large black bream population in the estuary. Several species of frogs, a diverse waterbug community and platypus inhabit the upper and lower reaches. The freshwater-saltwater interface of the Werribee River estuary is a regionally significant ecosystem due to the many aquatic plants and animals it supports, and it provides a nursery habitat for juvenile freshwater and estuarine fish species (such as black bream).

Environmental objectives in the Werribee system

	A1 – Maintain the native frog population
	F1 – Protect and increase the native freshwater fish population, including galaxiids, Australian grayling and tupong **F2** – Protect and support the black bream population in the estuary
	**G1** – Maintain channel beds and pool habitats **G2** – Maintain clean substrate surfaces to support biological processes
	**MI1** – Maintain and enhance the waterbug population to help break down dead organic matter and support the river's food chain
	**PR1** – Maintain the platypus population
	**V1** – Maintain the health and increase the cover of in-stream, streamside and estuary plants **V2** – Limit the spread of terrestrial plants and promote the recruitment of native water-dependent plant species on the banks and benches of waterways
	WQ1 – Maintain oxygen and salinity levels in pools

Traditional Owner cultural values and uses

Melbourne Water is working with the Registered Aboriginal Parties (RAPs) within the Werribee system — the Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC), the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation and the Bunurong Land Council Aboriginal Corporation — to strengthen relationships and increase Traditional Owners' involvement in the planning and delivery of water for the environment.

A partnership agreement is in place between Melbourne Water and Wadawurrung Traditional Owners Aboriginal Corporation to frame relations and obligations between the organisations. Melbourne Water is also is in discussions with Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation and the Bunurong Land Council Aboriginal Corporation to work towards developing similar partnership agreements. The intent is for Traditional Owners to be active partners in planning, delivering and monitoring deliveries of water for the environment associated with the Werribee River.

The Bunurong Land Council Aboriginal Corporation is working with the Bunurong people to determine the cultural objectives for Werribee River — *Weariby Yallok* in Bunurong language — on Bunurong Country. There are concerns about the low flow in the lower reaches and that fish of cultural importance to the Bunurong are not supported by the flow and are restricted in movement. This concern may be partially addressed through the implementation of Action 8-10 in the *Central and Gippsland Region Sustainable Water Strategy*, which aims to improve fish passage and the delivery of water for the environment to the lower Werribee River on Bunurong Country.

The Wadawurrung Traditional Owners Aboriginal Corporation has reviewed the environmental values of the Werribee River system. It has identified environmental values that have cultural significance to Wadawurrung Traditional Owners, which the table below shows. Further work is required to understand how potential environmental watering actions can support these cultural values.

Table 3.5.1 Wadawurrung cultural values and uses, Werribee River system

Reach	Extent	Key environmental values with cultural significance to the Wadawurrung
8	Werribee River	
9	Werribee River between Wyndham Vale and Bluestone Ford	
Estuary	Werribee River downstream of Bluestone Ford	

WTOAC has been working with waterway managers through the development of seasonal watering proposals, to improve outcomes on Country in line with the Paleert Tjaara Dja Wadawurrung Country Plan and the Wadawurrung Nationa Statement on water:

'Wadawurrung Yaluks and waterway ecosystems flowing freely and are healthy'.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria,*** the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 3.5.2**, Melbourne Water considered how environmental flows could support values and uses, including:

- water-based recreation (such as canoeing, fishing, kayaking and swimming)
- riverside recreation and amenity from urban cooling (such as camping, walking, cycling and picnicking)
- community events and tourism (such as Werribee Zoo).
- timing of environmental releases to avoid the dispersal of blue-green algae to the lower Werribee River, a valued recreation area.

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of environmental water in Victoria.

Table 3.5.2 describes the potential environmental watering actions in 2024-25, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 3.5.2 Werribee system potential environmental watering actions, expected effects and environmental objectives

Potential environmental watering action	Expected effects	Environmental objectives
Pyrites Creek (targeting reach 6)		
Winter/spring/ summer low flow (2 ML/day or natural during June to December)	• Provide sufficient water depth in riffle habitats for macroinvertebrates and native fish • Maintain habitat for frogs at the margin of the stream channel • Provide sufficient water depth to support the growth of flood-tolerant vegetation and limit the growth of terrestrial vegetation within the stream channel • Provide sufficient water depth to allow for native fish to move between pools	
Winter/spring freshes (three to five freshes of 30-40 ML/day for two days during June to November)	• Drown terrestrial plants that encroach into the waterway • Increase the growth and recruitment of streamside and in-stream vegetation • Transport carbon to drive aquatic food webs • Scour silt, biofilms and algae from substrates to maintain the quality and quantity of food and habitat for waterbugs • Improve water quality and the quantity of food and habitat for waterbugs, frogs and native fish • Wet depressions adjacent to the stream that frogs can use for breeding	
Spring high flow (one high flow of 70-130 ML/day for one to two days during September to October)	• Maintain access to food and habitat for waterbugs, native fish and frogs • Increase the growth and recruitment of streamside vegetation At 130 ML/day, the effects above plus: • Inundate the full width of the channel and high backwaters to flush accumulated organic matter and promote the growth and recruitment of streamside vegetation	
Werribee River (targeting reaches 8, 9 and estuary)		
Winter/spring low flow (80 ML/day during June to November)	• Provide sufficient depth to allow fish to move upstream past natural and artificial barriers • Facilitate the downstream movement of diadromous fish to the estuary • Drown terrestrial plant species and support the growth and recruitment of water-dependent streamside vegetation • Maintain permanent pools and increase the extent of habitat for waterbugs, fish, platypus and frogs • Maintain flow through pool habitats to allow mixing or suppression/dilution of saline groundwater	

Potential environmental watering action	Expected effects	Environmental objectives
Winter/spring freshes (two to four freshes of 350 ML/day for three days during June to October)	• Support the growth and recruitment of water-dependent streamside vegetation • Flush silt and scour biofilms and algae from substrates on the stream bed and maintain pools and channel dimensions • Provide movement cues and enough flow for fish to move upstream past natural and artificial barriers • Maintain water quality and quantity of food and habitat for waterbugs and platypus • Wet depressions adjacent to the stream that frogs can use for breeding	
Summer/autumn low flow (10 ML/day during December to May)	• Maintain habitat for in-stream and water-dependent streamside vegetation • Maintain access to habitat and improve water quality for native fish, frogs, platypus and waterbugs • Maintain flow through pool habitats to allow mixing or suppression/dilution of saline groundwater intrusion	
Summer/autumn freshes (three to five freshes of 135-215 ML/day for one to two days during December to May)	• Increase the growth and recruitment of water-dependent streamside vegetation • Flush silt and scour biofilms and algae from substrates on the stream bed and maintain pools and channel dimensions • Maintain access to habitat and improve water quality for native fish, frogs and platypus • Provide enough flow for native fish to move downstream past natural or artificial barriers • Maintain the quality of water within pools by dispersing azolla and blue-green algae blooms	

Scenario planning

Table 3.5.3 outlines potential environmental watering and expected water use in a range of planning scenarios.

Pyrites Creek is naturally ephemeral; it stops flowing for several months from late summer in most years and has longer periods without a flow in dry years. The reach has numerous permanent deep pools that support populations of native fish, frogs and some waterbugs during cease-to-flow periods. The Pyrites Creek catchment downstream of Merrimu Reservoir relies on environmental flows to maintain key components of the creek's flow regime, and while the specific volume and duration of flow events may vary from year to year, the recommended type of watering actions do not vary significantly between years or planning scenarios.

Water for the environment will be used to deliver a low flow during winter, spring and summer to maintain enough pool and riffle habitat to allow existing fish, macroinvertebrate and aquatic vegetation populations to persist. A sustained low flow during these seasons is also critical to support aquatic and flood-tolerant plants and prevent encroachment by terrestrial plant species. Winter/spring freshes and a spring high flow may also be delivered to achieve geomorphological objectives, improve the condition of in-stream and streamside vegetation and help grow native fish and frog populations.

The forecast available supply will not be sufficient to deliver all the required flow in the dry planning scenario, so the winter/spring/summer low flow will be delivered for a shorter duration to conserve water for other deliveries (such as regular freshes needed to top up and maintain permanent pools). The timing and duration of the winter/spring/summer low flow in the dry planning scenario will be based on commence and cease-to-flow triggers in the neighbouring Lerderderg River, which is also naturally short-lived.

The lower Werribee River relies heavily on the passing flow, operational deliveries and environmental flows to achieve many of the requirements for a low flow and freshes. In wet years, unregulated spills from Melton Reservoir, downstream tributary inflows and local run-off, including stormwater from urbanised areas of Werribee, boost the flow and deliver many of the larger flow components that cannot be provided through a managed environmental flow. In all planning scenarios, the passing flow and operational deliveries for irrigators are expected to meet low-flow requirements in the lower Werribee River partially. Water for the environment will be used to supplement other flows when needed to achieve the low flow target throughout the year and deliver summer/autumn freshes to manage water quality and control potential algal blooms. In all planning scenarios, there is insufficient water for the environment to meet low-flow demands year-round. In the dry and average planning scenarios, the demands are so large compared to the predicted supply that the demands would not be fully met even if all available water was prioritised for this purpose. For this reason, partial compliance with the low flow is the target under tier 1a. Water for the environment will be used to top up natural and operational flows as needed to manage the water quality or provide longitudinal connectivity for fish and platypus.

More work to define critical triggers for action has been identified as a priority area for monitoring in the lower Werribee River. Winter/spring freshes will be delivered as needed and as supply allows in the average and wet planning scenarios to support the movement and recruitment of native fish and platypus and to support streamside vegetation. There is unlikely to be enough supply to deliver winter/spring freshes in the dry planning scenario. The winter/spring low flow is a lower priority in all planning scenarios because it is likely to be at least partially met by natural inflows, which should maintain minimum habitat requirements. There is also a lower risk of adverse water quality outcomes under a lower-than-recommended flow during winter and spring, compared to summer and autumn.

In all planning scenarios, a minimum of 400 ML will be carried over to ensure high-priority flows can be delivered to Pyrites Creek (reach 6) and the lower Werribee River in 2025-26. Maintaining sufficient carryover in Lake Merrimu and Melton Reservoir will be prioritised over the delivery of tier 1b potential environmental watering actions in 2024-25.

Table 3.5.3 Werribee system environmental watering planning scenarios

Planning scenario	Dry	Average	Wet
Expected conditions	• Regulated flow conditions below Melton Reservoir year-round • Minimal passing flow to reach 6, possible operational water transfers during summer • Consumptive releases out of storage into reach 8 in summer/autumn	• Some spills from Melton Reservoir in winter/spring and periods of unregulated flow in reaches 8 and 9 and the estuary • Most low flow in reach 6 met by passing flow • Consumptive releases out of storage into reach 8 in summer/autumn	• Regular large spills from Melton Reservoir in winter/spring and long periods of unregulated flow in reaches 8 and 9 and the estuary • All low flow in reach 6 provided by passing flow • Consumptive releases out of storage into reach 8 in summer/autumn
Expected availability of water for the environment	• 1,300 ML	• 2,300 ML	• 3,400 ML
Pyrites Creek (targeting reach 6)			
Potential environmental watering – tier 1 (high priorities)	**Tier 1a (can be achieved with predicted supply)**		
	• Winter/spring/summer low flow (partial compliance) • Winter/spring freshes (three freshes) • Spring high flow	• Winter/spring/summer low flow • Winter/spring freshes (four freshes) • Spring high flow	• Winter/spring/summer low flow • Winter/spring freshes (five freshes) • Spring high flow
	Tier 1b (supply deficit)		
	• Winter/spring/summer low flow (full compliance)	• N/A	• N/A
Werribee River (targeting reaches 8, 9 and estuary)			
Potential environmental watering – tier 1 (high priorities)	**Tier 1a (can be achieved with predicted supply)**		
	• Summer/autumn low flow (partial compliance) • Summer/autumn freshes (three freshes)	• Winter/spring fresh (one fresh) • Summer/autumn low flow (partial compliance) • Summer/autumn freshes (five freshes)	• Winter/spring freshes (three freshes) • Summer/autumn low flow (partial compliance) • Summer/autumn freshes (five freshes)
	Tier 1b (supply deficit)		
	• Winter/spring low flow • Winter/spring freshes (two freshes) • Summer/autumn low flow (full compliance)	• Winter/spring low flow • Winter/spring freshes (three freshes) • Summer/autumn low flow (full compliance)	• Winter/spring fresh (one fresh) • Summer/autumn low flow (full compliance) • Winter/spring low flow

Planning scenario	Dry	Average	Wet
Possible volume of water for the environment required to achieve objectives	• 1,300 ML (tier 1a) • 18,700 ML (tier 1b)	• 2,360 ML (tier 1a) • 10,100 ML (tier 1b)	• 3,400 ML (tier 1a) • 7,000 ML (tier 1b)
Priority carryover requirements for 2025-26	• 400 ML	• 400 ML	• 400 ML

3.6 Moorabool system

Waterway manager – Corangamite Catchment Management Authority

Storage manager – Central Highlands Water

Environmental water holder – Victorian Environmental Water Holder

System overview

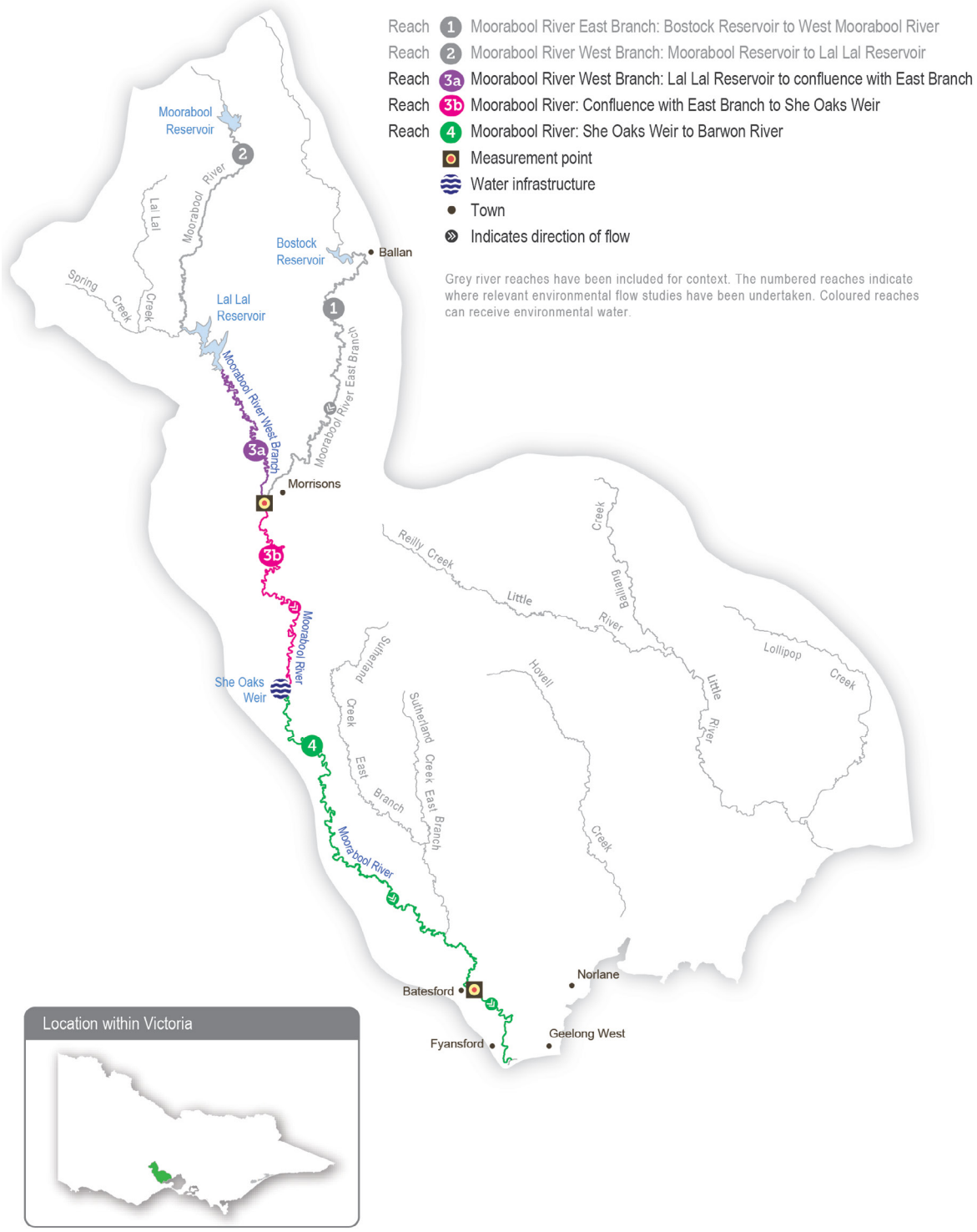
The Moorabool River is a tributary of the Barwon River. It flows south from the Central Highlands between Ballarat and Ballan to join the Barwon River at Fyansford, just north of Geelong (Figure 3.6.1). The Moorabool catchment is highly regulated with major storages, including Lal Lal, Moorabool and Bostock reservoirs.

The lower section of the Moorabool River between She Oaks and Batesford has nine private diversion weirs that are significant barriers to fish. These barriers have increased the extent of slow-flowing habitat and reduced habitat diversity.

Water allocated to the Moorabool River environmental entitlement is stored in Lal Lal Reservoir. The entitlement references passing flow, a significant component of annual streamflow, and helps maintain a low flow through winter. The use of environmental water in the Moorabool system is limited by inflows to the reservoir and by a use cap specified in the entitlement. The priority reaches for deliveries of water for the environment are between Lal Lal Reservoir and She Oaks Weir (reaches 3a and 3b, as shown in **Figure 3.6.1**), as that is where the available water can have the most benefit. Environmental flows may also benefit flow-dependent values in the reach between She Oaks Weir and the confluence with the Barwon River.

The Moorabool system is a water supply catchment for Barwon Water and Central Highlands Water. Releases from Lal Lal Reservoir for urban water supply contribute to environmental outcomes in reaches 3a and 3b (above Barwon Water's diversion point at She Oaks) and allow more efficient delivery of water for the environment to reach 4. Barwon Water and the Corangamite CMA coordinate operational and environmental releases, where possible, to optimise these benefits.

Figure 3.6.1 The Moorabool system



Environmental values

The Moorabool River is home to native fish species, including the Australian grayling, river blackfish, Australian smelt, flat-headed gudgeon, southern pygmy perch, short-finned eel, spotted galaxias and tupong. The system also contains extensive areas of endangered remnant vegetation, including streambank shrubland and streamside woodland ecological vegetation communities. Platypus, *rakali* (water rats) and a range of waterbugs are also present. The Moorabool River flows into the Barwon River, connecting it to the Ramsar-listed lower Barwon wetlands.

Environmental objectives in the Moorabool system

	F1 – Increase the distribution, abundance and diversity of migratory species (tupong, short-finned eel, common galaxias, spotted galaxias, short-headed lamprey and Australian grayling) **F2** – Increase the distribution, abundance and diversity of non-migratory species (flat-headed gudgeon, Australian smelt, southern pygmy perch and river blackfish)
	**PR1** – Maintain a self-sustaining, breeding platypus population and support the dispersal of juveniles and the movement of adults
	**V1** – Maintain in-stream macrophyte communities **V2** – Maintain streamside vegetation communities and promote recruitment
	**MI1** – Maintain the abundance and diversity of waterbug communities
	WQ1 – Maintain water quality **WQ2** – Prevent hypoxic blackwater events

Traditional Owner cultural values and uses

The Wadawurrung are the Traditional Owners of the land of Moorabool River and parts of the Barwon, Leigh and Yarrowee rivers. Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC) are the statutory authority for the management of Aboriginal heritage values and culture, under the *Victorian Aboriginal Heritage Act 2006*.

Wadawurrung Traditional Owners have a strong connection to the Moorabool River and place high cultural value on it. They are a key partner in advocating for additional water recovery to help support a healthy river and associated cultural water objectives.

In 2020, the Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC) released ***Paleert Tjaara Dja Let's make Country good together 2020-2030 Wadawurrung Country Plan***. The plan identifies waterways, rivers, estuaries and wetlands as key values to look after. WTOAC worked with waterway managers through the development of seasonal watering proposals to improve outcomes on Country in line with the *Paleert Tjaara Dja Wadawurrung Country Plan* and the Wadawurrung Nation Statement on water:

'Wadawurrung Yaluks and waterway ecosystems flowing freely and are healthy'.

In 2019, WTOAC partnered with the Corangamite CMA to complete an environmental flows study for the upper Barwon, Yarrowee and Leigh rivers. The 2019 flows study also identified cultural values in all waterways within Wadawurrung Country, including the Moorabool River, including:

- significant aquatic species such as platypus, short-finned eel, native trout galaxias spp, tupong, river blackfish, common reed and cumbungi/typha latifolia, which are traditional sources of food, materials and medicines
- waterway confluences and deep pools, which are places for meeting, ceremonies, trade and marking clan boundaries.

Table 3.6.1 Traditional Owner values and uses, Moorabool River

Objectives & opportunities	Values & uses	What environmental watering aims to do
Maintain or improve the abundance, breeding and recruitment of platypus	• Meat and pelt	• Provide pool habitat and connectivity between reaches
Maintain or improve the abundance of eels	• Meat, an important food source sometimes smoked • Large gatherings during the eel run at Buckley's Falls	• Provide water for pools, habitat and food sources, and water over riffles to allow eels to migrate
Maintain or improve the abundance of native trout galaxias spp	• Meat	• Provide water for pools, habitat and food sources, and water over riffles to allow fish to move between pools and breed, feed and find new habitat
Maintain or improve the abundance of river blackfish	• Meat	
Maintain or improve the abundance of water ribbons (*Triglochin procera*)	• Plant food: finger-shaped tubers are crisp and sweet and cooked in a ground oven	• Maintain an adequate depth of water in channels
Maintain or improve the condition, extent and abundance of common reed (*Phragmites australis*), pale rush (*Juncus pallidus*) and cumbungi (*Typha latifolia*)	• Common reed (*Phragmites australis*). Weapon-stems used for spear shafts for fishing. Reed cut while still green to make necklaces, weaving bags and baskets. Also, a food plant. • Weaving baskets • Fluff is used to pack wounds under a paperbark bandage	• Maintain an adequate depth of water to limit terrestrial encroachment into aquatic habitats. This will also support growth on terraces, channel edges and lower banks
Maintain or improve the abundance of river red gum (*Eucalyptus camaldulensis*)	• The bark is removed for canoe, shelter and tools • Bowls • Nectar drink • Medicinal uses: the gum or sap was used for burns to shrink or seal them; the sap is high in tannin • Leaves are used for steam baths	
Maintain or improve the abundance of manna gum (*Eucalyptus viminalis*) and swamp wallaby grass (*Amphibromus reservatus*)	• Timber is used for making clubs and shields • The sap-sucking lerp bug was gathered each season • Young leaves were fed onto a fire near the patient, and a poultice of well-chewed leaves was applied for backache • Quail flocks were attracted to manna gums • Leaves were split, dried out and re-constituted in running water • Fibres were twisted into rope to make long nets for game hunting	• Environmental watering cannot be considered in 2024-25 due to various constraints (such as an insufficient entitlement)

Objectives & opportunities	Values & uses	What environmental watering aims to do
Deep pools	• Deep pools have cultural significance	• Help fill and ensure connectivity to pools where possible
Confluences (e.g. Moorabool and Barwon rivers)	• Confluences have high cultural value due to their historical use as meeting places for three different clans	• Maintain an adequate depth of water for connectivity
Holding cultural events on the Moorabool River	• Celebrations of culture, family events, fishing days and cultural festivals	• Summer/autumn freshes and some winter/spring freshes can be delivered to coincide with cultural events. This can support significant cultural values and species for a lead-up to or duration of an event.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 3.6.2**, the Corangamite CMA considered how environmental watering could support cultural, social, recreational and economic values and uses, including peak recreational use as required in the Victorian *Water Act 1989*, as long as the delivery did not compromise environmental outcomes.

Social and recreational activities that may benefit from environmental water releases in the Moorabool system include camping, canoeing, kayaking, rowing, swimming and angling.

Summer/autumn freshes will increase the Moorabool River's low flow and improve riverside and water-based recreation opportunities, particularly camping and fishing. Delivery of these freshes may coincide with school and public holidays, but the timing or management of planned 2024-25 environmental flows will not be specifically modified to align with holiday periods.

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of environmental water in Victoria.

Table 3.6.2 describes the potential environmental watering actions in 2024-25, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 3.6.2 Moorabool system potential environmental watering actions, expected effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Moorabool River (targeting reach 3a)		
Winter/spring low flow (5-60 ML/day during June to November)	At 5 to 10 ML/day: • Maintain in-stream vegetation • Maintain connectivity and allow fish movement through the reach • Maintain pool and riffle habitat for platypus and native fish A higher continuous flow of 60 ML/day would inundate the full extent of the channel bed and reduce intrusion by terrestrial vegetation into the stream bed	F1, F2 PR1 V1
Winter fresh (one fresh of 80-90 ML/day for five to 10 days during June to August)	• Provide connectivity between riffle and pool habitats to support fish and platypus movement through the reach • Trigger the downstream spawning migration of tupong • Maintain a clear flow path and control intrusions by terrestrial vegetation • Flush silt, scour pools and remove biofilms from hard substrates and the stream bed to maintain waterbug communities, and transport organic matter to prevent blackwater events	F1, F2 MI1 PR1 V1, V2
Spring fresh(es) (one to two freshes of 80-90 ML/day for five to 10 days during September to November)	• Provide connectivity between riffle and pool habitats to support fish and platypus movement through the reach • Trigger the upstream migration of juvenile galaxias, tupong, short-finned eel and Australian grayling • Temporarily inundate the lower part of the riverbank to maintain the diversity of fringing vegetation species and promote the growth and recruitment of streamside vegetation • Flush silt, scour pools and remove biofilms from hard substrates and the stream bed to maintain waterbug communities and transport organic matter to prevent blackwater events	F1, F2 MI1 PR1 V1, V2
Summer/autumn low flow (5-40[1] ML/day during December to May)	At 5 to 10 ML/day: • Maintain refuge pools and riffle habitat for fish, waterbugs and platypus and submerged aquatic vegetation • Maintain water quality for aquatic life by reducing periods of low oxygen, high temperature and high salinity • Flow above 30 ML/day water fringing vegetation	F1, F2 MI1 PR1 V1 WQ1

Potential environmental watering action	Expected watering effects	Environmental objectives
Small summer/ autumn fresh (one fresh of 30-60 ML/ day for three days during February to March)	• Allow fish and platypus movement through the reach • Maintain clear flow path and control intrusions by terrestrial vegetation • Flush silt and scour biofilms and algae from the stream bed and transport organic matter to improve habitat and food for waterbugs • Water fringing vegetation	F1, F2  MI1  PR1  V2
Large summer/ autumn fresh(es) (one to two freshes of 60-80 ML/day for five days during January to May)	• Trigger the downstream spawning migration of adult short-finned eel (January-February) and Australian grayling (April-May) • Maintain pool and riffle habitat and the condition of streamside vegetation, and promote recruitment • Allow fish and platypus to move through the reach to access habitat • Flush silt and scour biofilms and algae from the stream bed and substrates to improve habitat quality for waterbugs • Maintain water quality by reducing periods of low-oxygen water, high water temperature and salinity	F1, F2  MI1  PR1  V2
Year-round freshes (trigger-based, of 30 ML/day for three days) *Triggers:* • *oxygen below 5 mg/L* • *electrical conductivity above 10,000 µ s/cm* • *water temperature above 25°C*	• Maintain water quality by reducing periods of low oxygen, high water temperature and salinity	WQ1, WQ2

1 The flow will generally target between 5 and 10 ML per day at the compliance point, but 40 ML per day could be achieved in combination with Barwon Water's transfer to She Oaks Weir and passing flow.

Scenario planning

Table 3.6.3 outlines potential environmental watering and expected water use in various planning scenarios.

There is limited variation in the proposed watering regime year to year due to restrictions on how much water for the environment can be used each year. The *Moorabool River Environmental Entitlement 2010* stipulates that a maximum of 7,500 ML can be used over three consecutive years. This effectively limits environmental water use to 2,500 ML a year because a larger volume could only be delivered in one year if less water had been delivered in the previous two years, and it would reduce the volume that could be used in the two subsequent years.

The Moorabool River requires a continuous low flow throughout the year and periodic freshes in all planning scenarios to achieve the intended environmental outcomes.

In the drought and dry planning scenarios, the main objective is to deliver a sufficient flow to maintain enough habitat to prevent significant declines in existing populations of native fish and platypus. There will be limited natural inflow to the river in these planning scenarios, so water for the environment will be used to deliver a low flow at the lower end of the recommended range (5 ML per day) to maintain a continuous flow throughout reach 3a for as long as possible. Water for the environment may be added to operational transfers to increase flow variability downstream of Lal Lal Reservoir and maintain some flow in the reaches downstream of She Oaks Weir once operational water is diverted. Even with these proposed watering actions, sections of the Moorabool River are likely to periodically cease flowing in the dry or drought planning scenarios, which would reduce the river's environmental condition and the size of plant and animal populations. In the drought planning scenario, water quality will be regularly monitored to inform the delivery of trigger-based, year-round freshes as needed.

In the average and wet planning scenarios, most of the recommended flow is expected to be provided through a combination of the natural flow, passing flow and operational releases, which will mean water for the environment can be used to deliver additional freshes to improve environmental conditions and increase populations of native plants and animals.

Delivering one large summer/autumn fresh in April/May is a high priority in all planning scenarios to trigger Australian grayling migration and spawning. In the average and wet planning scenarios, an additional large summer/autumn fresh is proposed for January/February to trigger the downstream spawning migration of short-finned eel.

Winter and spring freshes are a lower priority than summer/autumn freshes and consequently depend on water availability in drought and dry conditions. A winter fresh would be delivered to trigger the downstream spawning migration of adult tupong, whereas spring freshes will aim to trigger the upstream migration of juvenile galaxias, tupong, short-finned eel and Australian grayling.

Although environmental flows in the Moorabool River primarily target outcomes in reaches 3a and 3b, deliveries will be planned where possible to also provide benefits in reach 4.

The environmental entitlement for the Moorabool system caps use at 7,500 ML over three years. Use in 2024-25 will be capped at 2,500 ML, leaving sufficient allocation to support watering actions in 2025-26.

Table 3.6.3 Moorabool system environmental watering planning scenarios

Planning scenario	Drought	Dry	Average	Wet
Expected conditions	• Little rainfall with no inflow to Lal Lal Reservoir • Regular periods of no flow	• Below-average rainfall and inflow to Lal Lal Reservoir • Cease-to-flow events	• Moderate inflows to Lal Lal Reservoir, especially during winter and spring • Low flow over summer and high peaks in winter months	• Lal Lal Reservoir is likely to fill and spill • Continuous flow year-round • Overbank flow in some parts during winter/spring
Expected availability of water for the environment	• 2,500 ML[1]			
Moorabool River (targeting reach 3a)				
Potential environmental watering – tier 1 (high priorities)	**Tier 1a (can be achieved with predicted supply)**			
	• Winter/spring low flow (5 ML/day) • Summer/autumn low flow (5 ML/day) • Large summer/autumn fresh (one fresh of 60 ML/day) • Year-round fresh(es) (if required)	• Winter/spring low flow (5 ML/day) • Spring fresh (one fresh for five days of 80 ML/day) • Summer/autumn low flow (5 ML/day) • Large summer/autumn fresh (one fresh of 60 ML/day)	• Winter/spring low flow (5 ML/day) • Winter fresh (one fresh for five days of 80 ML/day) • Spring fresh (one fresh for five days of 80 ML/day) • Summer/autumn low flow (5 ML/day) • Small summer/autumn fresh (one fresh of 30 ML/day) • Large summer/autumn freshes (two freshes of 60 ML/day)	• Winter/spring low flow (of greater than 10 ML/day) • Winter fresh (one fresh for five days of 80 ML/day) • Spring freshes (two freshes for five days of 80 ML/day) • Summer/autumn low flow (of greater than 10 ML/day) • Small summer/autumn fresh (one fresh of 30 ML/day) • Large summer/autumn freshes (two freshes of 60 ML/day)
	Tier 1b (supply deficit)			
	• Winter fresh (one fresh for five days of 80 ML/day) • Spring fresh (one fresh for five days of 80 ML/day)	• Winter fresh (one fresh for five days of 80 ML/day)	• Spring fresh (one additional fresh for five days of 80 ML/day)	• N/A

Planning scenario	Drought	Dry	Average	Wet
Potential environmental watering – tier 2 (additional priorities)	• Winter/spring low flow (tier 1a delivered at increased magnitude: 10 ML/day) • Summer/autumn low flow (tier 1a delivered at increased magnitude: 10 ML/day) • All other tier 1a and 1b watering actions delivered at the upper end of the recommended magnitude range		• Tier 1a and 1b watering actions delivered at the upper end of the recommended volume range	
Possible volume of water for the environment required to achieve objectives	• 2,493 ML (tier 1a) • 1,130 ML (tier 1b) • 3,076 ML (tier 2)	• 2,508 ML (tier 1a) • 565 ML (tier 1b) • 3,076 ML (tier 2)	• 2,400 ML (tier 1a) • 495 ML (tier 1b) • 15,369 ML (tier 2)	• 780 ML (tier 1a) • 0 ML (tier 1b) • 9,140 ML (tier 2)
Priority carryover requirements for 2025-26	• The environmental entitlement for the Moorabool system caps use at 7,500 ML over three years. Use in 2024-25 will be capped at 2,500 ML, leaving sufficient allocation to support watering actions in 2025-26.			

1 Up to 7,086 ML can be stored under the Moorabool River Environmental Entitlement 2010. However, the entitlement is subject to delivery rules — a maximum of 7,500 ML over three consecutive years — which restricts delivery of water to 2,500 ML per year.

3.7 Barwon system

Waterway manager – Corangamite Catchment Management Authority/Melbourne Water

Storage manager – Barwon Water

Environmental water holder – Victorian Environmental Water Holder

The Barwon system includes the upper Barwon River and lower Barwon wetlands.

The Barwon River flows east from the Otway Ranges, passing the towns of Forrest, Birregurra, Winchelsea, Inverleigh and the City of Geelong before discharging into Bass Strait at Barwon Heads. The Leigh and Moorabool rivers are major tributaries, joining the Barwon River at Inverleigh and Fyansford, respectively. Other tributaries, including Birregurra, Boundary, Callahan, Dewing, Matthews, Pennyroyal, Deans Marsh and Gosling creeks, flow into the Barwon River above Winchelsea. The main storages in the Barwon River catchments are the West Barwon and Wurdee Boluc reservoirs.

The Barwon estuary contains a Ramsar-listed system of wetlands and lakes collectively called the lower Barwon wetlands. Water for the environment can be used to manage the flow in the upper Barwon River and manage water levels in Reedy Lake and Hospital Swamps, which connect to the lower Barwon River.

3.7.1 Upper Barwon River

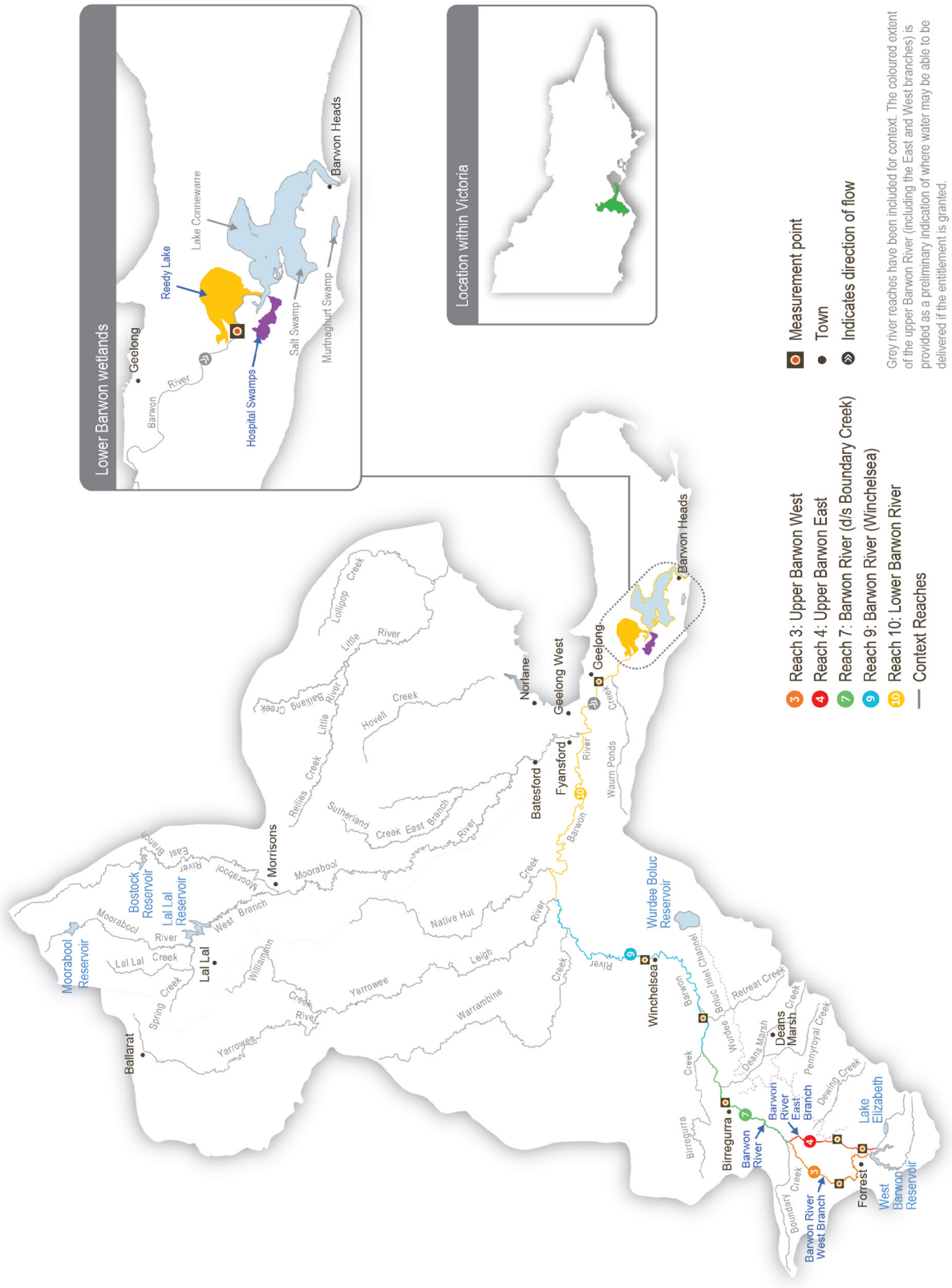
System overview

The operation of the West Barwon Reservoir regulates flows in the upper Barwon River. Water can be released directly from the reservoir into the west or east branches via a diversion tunnel. The junction of the two branches is near Boundary Creek. Downstream of the reservoir, operational water can be diverted into the Wurdee Boluc inlet channel, a 57 km concrete-lined channel that transfers water to Wurdee Boluc Reservoir.

Barwon Water releases passing flow in the order of 1-5 ML per day in both the upper east and west branches from the West Barwon Reservoir. These releases may increase to 15 ML per day in September in a wet year. When the West Barwon and Wurdee Boluc reservoirs collectively hold more than 40,000 ML, all the natural flow is passed down the east branch between January and March. Flood spills from the reservoir and natural inflows from unregulated and regulated tributaries add to the passing flow in the west branch. Regulated and unregulated tributaries add to the passing flow in the east branch.

The *Upper Barwon River Environmental Entitlement 2018* enables water for the environment to be made available from the West Barwon Reservoir. The entitlement provides an average of 1,000 ML per year and up to 2,000 ML of the total storage capacity at full supply. Water for the environment was first delivered to the upper Barwon River in 2018-19. The current entitlement provides only enough water to meet the highest-priority potential environmental watering actions in the upper Barwon east branch (reach 4) and the upper Barwon west branch (reach 3) in particular climatic conditions.

Figure 3.7.1 The Barwon system



Environmental values

The upper Barwon River is home to platypus and native fish species, including the river blackfish, short-finned eel, southern pygmy perch, Australian smelt and various galaxias. The system retains some submerged aquatic vegetation, undercut banks, overhanging vegetation and riffle-pool sequences, which provide essential habitat for fish and other aquatic animals.

Long-term environmental objectives for the upper Barwon system are based on delivering watering actions recommended in the *Upper Barwon, Yarrowee and Leigh rivers FLOWS study*. These include improving the breeding and recruitment of various fish, platypus and macroinvertebrate species, as well as improving the condition, extent and diversity of in-stream, emergent, streamside and floodplain vegetation. However, due to the limited size of the environmental entitlement and channel constrictions, the flow magnitudes for the potential watering actions described in this plan have been adjusted to be less than the known channel constraints. The watering actions presented in this plan aim to maintain rather than improve current ecological conditions within the upper Barwon River. Significant improvements in ecological condition are unlikely until complementary actions are taken to address channel constraints and other factors (such as unrestricted livestock access and weed infestation).

Environmental objectives in the upper Barwon River

	F1 – Maintain the abundance of migratory fish species, including short-finned eels and tupong **F2** – Maintain the abundance of resident freshwater fish, including several species of galaxias, Australian smelt, big-headed gudgeon, Yarra pygmy perch, southern pygmy perch and river blackfish
	**MI1** – Maintain the abundance of waterbugs as a food source for the native fish, frog and platypus populations
	**PR1** – Maintain the abundance of the platypus population
	**V1** – Maintain the condition and extent of in-stream vegetation to provide structural habitat for waterbugs and various fish species **V2** – Maintain the condition, extent and diversity of emergent macrophyte vegetation and streamside vegetation to provide structural habitat and stabilise the channel and lower banks
	WQ1 – Maintain water quality for native fish, waterbugs, other water-dependent animals and aquatic vegetation

Traditional Owner cultural values and uses

The reaches of the Barwon River that can be most influenced by water delivered from the West Barwon Reservoir sit on Eastern Maar Country.

In February 2020, the Eastern Maar Aboriginal Corporation (EMAC) received Registered Aboriginal Party (RAP) status under the Victorian *Aboriginal Heritage Act 2006* over a large portion of land in south-west Victoria, including the Barwon River upstream of Winchelsea. In 2023 Eastern Maar gained formal recognition of their rights under the Commonwealth *Native Title Act 1993* for over half of the RAP area and on the 21st of March 2024, the Federal Court of Australia handed down a third native title determination, marking a significant milestone since their initial recognition in 2011 under the Native Title Act. Further areas remain in negotiation. Native Title determination acknowledges Eastern Maar's ongoing connection and intrinsic relationship to Country across south-west Victoria, including parts of the Barwon River catchment.

Eastern Maar obligations to Country and objectives for Country are described in the Eastern Maar Country Plan *Meerreengeeye Ngakeepoorryeeyt* (EMAC, 2015). Eastern Maar assertions for *parreeyt* (water) are further documented in Eastern Maar's Nation Statement in *Water is Life: Traditional Owner Access to Water Roadmap (DEECA 2022)*.

The current environmental entitlement can have the most effect on the river reaches between the West Barwon Reservoir and Winchelsea, with diminishing benefits to the reaches downstream. The reaches of the river downstream of Winchelsea sit on Wadawurrung Country. The Corangamite CMA is working with the Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC) to understand opportunities to provide for cultural values and uses and other aspirations for the management of water for the environment in the Barwon River downstream of Winchelsea, on Country where WTOAC holds Registered Aboriginal Party status. In early 2024, the Corangamite CMA met with WTOAC to discuss seasonal watering proposals in the Corangamite catchment.

The Eastern Maar Aboriginal Corporation and WTOAC have formal plans for how to heal Country in the region, and the Corangamite CMA continues to work with each Traditional Owner group to identify their cultural objectives and associated values and uses that align with environmental flows.

WTOAC has been working with waterway managers through the development of seasonal watering proposals, to improve outcomes on Country in line with the *Paleert Tjaara Dja* Wadawurrung Country Plan and the Wadawurrung Nationa Statement on water:

- By 2030, the water in the waterways of the Barree Warree Yulluk is clean enough to drink
- By 2025, the waterways of the Barree Warree Yulluk will have sufficient cultural flows and connectivity to support culturally important species
- Wadawurrung Yaluks and waterway ecosystems are flowing freely and are healthy.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

The adjacent land use of the upper Barwon River is dominated by grazing for livestock (beef, sheep and dairy) and forestry and is of significant economic value. Limited public access to the river frontage limits the upper Barwon's social and recreational values and uses.

In planning the potential environmental watering actions, the Corangamite CMA considered how environmental flows could support values and uses, including:

- water-based recreation (such as swimming and fishing, particularly for river blackfish)
- riverside recreation and amenity (such as birdwatching, camping, trail running, mountain bike riding and walking)
- socioeconomic benefits (such as for diverters for stock needs and domestic use; water levels and water quality can rely on the delivery of water for the environment, particularly in summer).

Although the watering actions listed in this proposal may support social, recreational and economic values and uses, watering actions in the upper Barwon are not actively modified to accommodate such values and

uses. Social and recreational uses of the upper Barwon River include recreational fishing and riverside activities (such as bike riding, walking and running). The river also supports economic benefits for stock and domestic users. Environmental watering supports a healthy system and connectivity, allowing fish to move. It also supports water quality that delivers active and passive benefits, including for stock and domestic uses.

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of environmental water in Victoria.

Table 3.7.1 describes the potential environmental watering actions in 2024-25, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 3.7.1 Upper Barwon River potential environmental watering actions, expected effects and environmental objectives

Potential environmental watering action	Expected effects	Environmental objectives
Upper Barwon River (targeting reach 3 – west branch)		
Winter/spring low flow (3-15 ML/day during June to November)	• Maintain permanent water in the channel/pools to provide habitat to support resident and migratory fish and platypus • Maintain an adequate depth of permanent water in the channel to promote the recruitment of aquatic and streamside plants and to limit the encroachment of terrestrial species	F1, F2  PR1  V1, V2
Summer/autumn low flow (3-15 ML/day during December to May)		
Upper Barwon River (targeting reach 4 – east branch)		
Winter/spring low flow (1-9 ML/day during June to November)	• Maintain an adequate depth of permanent water in the channel and pools to provide habitat for resident and migratory fish and platypus • Maintain an adequate depth of permanent water in the channel to promote the recruitment of aquatic and streamside plants and to limit the encroachment of terrestrial species • Provide sufficient flow velocity to mix pools	F1, F2  PR1  V1, V2 WQ1
Summer/autumn low flow (0.5-5 ML/day during December to May)	• Maintain an adequate depth of permanent water in the channel/pools to provide habitat for resident and migratory fish and platypus • Maintain an adequate depth of permanent water in the channel to promote the recruitment of aquatic and streamside plants and to limit the encroachment of terrestrial species • Provide a minimum velocity to mix pools	F1, F2  PR1  V1, V2 WQ1

Potential environmental watering action	Expected effects	Environmental objectives
Summer/autumn freshes (two to three freshes of 6-9 ML/day for two days during December to May)	• Increase the water depth in the channel and pools to allow for the movement of resident and migratory fish and platypus • Provide a mosaic of wetted areas to maintain in-stream, emergent and streamside vegetation • Provide minimum velocity to mix pools and improve habitat quality for fish and waterbugs	F1, F2  MI1  PR1  V1, V2 WQ1

Scenario planning

Table 3.7.2 outlines potential environmental watering and expected water use in various planning scenarios.

Planned watering actions for the upper Barwon River are derived from recommendations in the *Upper Barwon, Yarrowee and Leigh rivers FLOWS study*. Many of the flow magnitudes recommended in the study cannot be delivered due to the size of the environmental entitlement and the risk of inundating private land.

The planned watering actions presented in **Table 3.7.2** are deliberately less than the known channel capacity constraints and would provide a lower environmental benefit than the recommended environmental flows. Given this limitation, the main aim of watering actions is to deliver enough flow through the system to maintain pool habitat and food (waterbugs) for aquatic animals. A low flow will aim to prevent or limit cease-to-flow events, and small freshes will be delivered as needed in the east branch during summer and autumn to manage potential water quality issues. The overall approach to environmental flows in the upper Barwon River in 2024-25 will help maintain existing populations of native fish, platypus and waterbugs, and it relies on natural events to deliver the greater flows needed to facilitate the movement and potential breeding of fish and platypus.

The Corangamite CMA will monitor conditions during deliveries of water for the environment in 2024-25 so that release rates can be promptly adjusted to avoid inundating private land. The Corangamite CMA will continue to work with relevant agencies and landholders to investigate options that will allow future deliveries of water for the environment to be closer to their recommended magnitude and avoid affecting private land without consent. The Barwon Flagship Project is a newly established, integrated catchment management project working with stakeholders to address flow restrictions through streamside management and to improve the overall health of the upper Barwon River.

The carryover reserve for 2024-25 for the upper Barwon River is 500 ML, the drought reserve amount agreed with the Upper Barwon Surface Water Advisory Group.

Table 3.7.2 Upper Barwon River environmental watering planning scenarios

Planning scenario	Dry	Average	Wet
Expected conditions	• Disconnected pools during summer and autumn • Cease-to-flow events	• Low flow in summer and autumn • Peak flow in winter and spring	• Continuous flow throughout the year • Reservoir spills are likely, especially during winter and spring
Expected availability of water for the environment	• 2,180 ML	• 2,250 ML	• 2,350 ML
Upper Barwon River (targeting reach 3 – west branch)			
Potential environmental watering – tier 1 (high priorities)	**Tier 1a (can be achieved with predicted supply)**		
	• Summer/autumn low flow (delivered at a lower magnitude in the range)	• Summer/autumn low flow (delivered at a lower magnitude in the range)	• Summer/autumn low flow • Winter/spring low flow
	Tier 1b (supply deficit)		
	• Winter/spring low flow (delivered at a lower magnitude in the range)	• Winter/spring low flow (delivered at a lower magnitude in the range)	
Potential environmental watering – tier 2 (additional priorities)	• N/A		
Upper Barwon River (targeting reach 4 – east branch)			
Potential environmental watering – tier 1 (high priorities)	**Tier 1a (can be achieved with predicted supply)**		
	• Summer/autumn low flow (delivered at a lower magnitude in the range) • Summer/autumn freshes (two freshes)	• Summer/autumn low flow (delivered at a lower magnitude in the range) • Summer/autumn freshes (two freshes)	• Summer/autumn low flow • Summer/autumn freshes (three freshes) • Winter/spring low flow
	Tier 1b (supply deficit)		
	• Winter/spring low flow	• Winter/spring low flow	
Potential environmental watering – tier 2 (additional priorities)	• N/A		

Planning scenario	Dry	Average	Wet
Possible volume of water for the environment required to achieve objectives	• 1,264 ML (tier 1a) • 2,340 ML (tier 1b)	• 1,086 ML (tier 1a) • 1,170 ML (tier 1b)	• 900 ML (tier 1a) • 0 ML (tier 1b)
Priority carryover requirements for 2025-26	• 500 ML		

3.7.2 Lower Barwon wetlands

System overview

The estuarine reach of the Barwon River contains a system of wetlands and lakes, including Lake Connewarre, Reedy Lake and Hospital Swamps, Salt Swamp and Murtnaghurt Lagoon (Figure 3.7.1). For thousands of years, the system has been a place of great significance to the Wadawurrung Traditional Owners. *Paleert Tjaara Dja Let's make Country good together 2020-2030 Wadawurrung Country Plan* acknowledges the system's special place in their Dreaming.

Water for the environment can be used to manage water levels in Reedy Lake and Hospital Swamps, which connect to the Barwon River. The environmental entitlement for the lower Barwon wetlands does not provide access to water held in storage. Instead, it allows water to be diverted from the Barwon River into Reedy Lake and Hospital Swamps when river levels are above 0.7 m AHD. High water levels in the Barwon River can also result in the natural wetting of the wetlands.

Environmental values

Reedy Lake and Hospital Swamps form part of the internationally recognised Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site, which is used by many thousands of migratory birds from around the world. The wetlands support 47 known threatened plant and animal species and communities. These include some of Victoria's rarest species (such as the brolga, orange-bellied parrot, Australasian bittern, growling grass frog, Australian grayling, and dwarf galaxias) and subtropical and temperate coastal saltmarsh communities. Reedy Lake also supports a range of vegetation communities, including coastal saltmarsh, herbfields and reed beds.

Reedy Lake was naturally a partly ephemeral system, but river regulation meant the lake was nearly permanently wet from the 1970s until 2016. Wetting and drying regimes are now recommended to maintain the lake's ecological character and diverse habitats.

Following a four-year (2016-17 to 2019-20) watering regime trial at Reedy Lake, the Lower Barwon Review in 2020 proposed to implement a long-term, seasonally adaptive water regime that avoids complete drying. At Reedy Lake, this means having the wetland full for a quarter of all years and having a partial drawdown in summer and autumn in three-quarters of all years. The review's recommendations have informed 2024-25 watering actions and future directions.

Hospital Swamps comprises five wetland basins that support important ecological processes and significant environmental values, including large areas of threatened coastal saltmarsh and diverse waterbird communities. Hospital Swamps has retained a more natural wetting and drying pattern. As a result, the swamp's vegetation community has remained essentially unchanged since the 1980s.

Environmental objectives in the lower Barwon wetlands

B1 – Provide suitable feeding and breeding habitat for waterbirds, including mudflats and shallow water for wading birds, flooded vegetation and wetland fringes

CN1 – Maintain nutrient cycling and improve lake productivity

F1 – Provide habitat for fish breeding and growth and improved conditions for migration and dispersal when wetlands are connected to the Barwon River

F2 – Reduce the carp population

MI1 – Increase the waterbug population and its biomass

V1 – Increase the diversity of ecological vegetation communities in the wetlands and increase the recruitment of aquatic vegetation

V2 – Increase the growth and extent of coastal saltmarsh, herbfields and lignum shrubland ecological vegetation communities

V3 – Retard colonisation of tall reed in low-lying areas and increase open-water habitat

WQ1 – Remove accumulated salts

WQ2 – Maintain surface water and groundwater interactions

Traditional Owner cultural values and uses

The lower Barwon wetlands are part of Wadawurrung Country. The Corangamite CMA is continuing to work with the Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC) to support their values and uses of the wetlands and to refine the CMA's understanding of how the water regimes in the lower Barwon wetlands can support Wadawurrung aspirations.

The Corangamite CMA met with WTOAC in early 2024 at the beginning of the seasonal watering proposal planning process. WTOAC reviewed and approved the relevant section content in the lower Barwon wetlands seasonal watering proposal and the proposed watering. WTOAC is also part of the broader lower Barwon community advisory committee.

Wadawurrung people place a high cultural value on the Barwon River. Many Wadawurrung people in the region have a connection and long history with the river. Under the *Aboriginal Heritage Act 2006* and the Aboriginal Heritage Regulations (2007), any waterway or Ramsar-listed site is recognised as culturally sensitive.

In 2018, the Corangamite CMA engaged representatives from WTOAC to inform part of the upper Barwon, Yarrowee and Leigh rivers FLOWS study update (Alluvium, 2021) and to assist in capturing Aboriginal values relevant to Wadawurrung Country in each of the waterway reaches. Many of these values, notably culturally significant species, are also common to wetlands of the Barwon River system.

WTOAC's 2020 ***Paleert Tjaara Dja Let's make Country good together 2020-2030 Wadawurrung Country Plan*** identifies important cultural values and recommendations for the lower Barwon wetlands, including:

- culturally significant wetland species (such as brolga, black duck, black swan, short-finned eel, common reed and bull rush)
- recognition of wetlands as meeting, ceremony and trade places
- maintaining water holes and refuge pools
- maintaining access to culturally important story places and ceremonial places
- protection of artefact sites
- use of appropriate Wadawurrung language for places of cultural importance
- increased opportunities for the Wadawurrung to be involved in monitoring and evaluation activities

- inclusion of the Wadawurrung in all communications about releases of water for the environment and other wetland-related activities.

Paleert Tjaara Dja acknowledges Reedy Lake and Hospital Swamps as special places in Wadawurrung Dreaming.

> "The chain of ponds from the Barwon River to Reedy Lake, Hospital Lake, Lake Connewarre and Estuary Bay is connected through water and Black Swan Dreaming".

WTOAC has been working with waterway managers through the development of seasonal watering proposals, to improve outcomes on Country in line with the ***Paleert Tjaara Dja Let's make Country good together 2020-2030 Wadawurrung Country Plan*** and the ***Wadawurrung Nation Statement***. Objectives in these documents include:

- By 2030, the water in the waterways of the Barree Warree Yulluk is clean enough to drink
- By 2025, the waterways of the Barree Warree Yulluk will have sufficient cultural flows and connectivity to support culturally important species
- Wadawurrung Yaluks and waterway ecosystems are flowing freely and are healthy.

Increasing the involvement of Traditional Owners in managing environmental flows and progressing opportunities towards self-determination in the environmental watering program is a core commitment of the VEWH and its program partners. This is reinforced by legislation and policy commitments, including the *Water Act 1989*, the ***Victorian Aboriginal Affairs Framework***, the 2016 ***Water for Victoria***, the 2022 ***Water is Life: Traditional Owner Access to Water Roadmap***, and, in some cases, agreements under the *Traditional Owner Settlement Act 2010*.

Social, recreational and economic values and uses

In planning the potential environmental watering actions in **Table 3.7.3**, the Corangamite CMA consulted widely with stakeholders to ensure it considered shared benefits, including social, economic and recreational values relevant to environmental flows management in the lower Barwon wetlands. Opportunities for social, recreational and economic values and uses are incorporated into planning and watering decisions if they do not compromise environmental outcomes.

Expert advice (such as the 2012 environmental flows study for the lower Barwon wetlands and the 2020 Lower Barwon Review) emphasised that the entire lower Barwon recommended watering regime — providing a fill to the wetlands and allowing water levels to draw down at the right times — would have to be implemented to improve biodiversity and protect the long-term health of the wetlands. This may mean it is not possible to meet some community expectations for shared benefits that don't maintain or improve environmental outcomes. The Corangamite CMA manages water levels in the wetlands to meet environmental requirements which have shared benefits that support a range of social, economic and recreational values and uses, including:

- water-based recreation (such as boating, duck hunting and fishing)
- wetlands recreation and amenity (such as birdwatching and spending time outdoors)
- community events (including Traditional Owner events) and tourism
- socioeconomic benefits (such as commercial fishing).

Scope of environmental watering

The term 'environmental watering' refers to the active delivery of held environmental water to support particular environmental objectives by altering the flow in a river or water level in a wetland. While other terms are sometimes used to describe the delivery of environmental water, 'environmental watering' is deliberately used here and in seasonal watering statements to ensure consistency in the legal instruments that authorise the use of environmental water in Victoria.

Table 3.7.3 describes the potential environmental watering actions in 2024-25, their expected watering effect (that is, the intended physical or biological effects of the watering action) and the longer-term environmental objectives they support. Each environmental objective relies on one or more potential environmental watering actions and their associated physical or biological effects.

Table 3.7.3 Lower Barwon wetlands potential environmental watering actions, expected effects and environmental objectives

Potential environmental watering action	Expected watering effects	Environmental objectives
Reedy Lake		
Autumn/winter/ spring fill (April to November) and top-ups as required (year-round) (targeting 0.8 m AHD)	• Maintain a mosaic of water depths and resources across the wetland to support waterbird breeding events • Inundate fringing wetland vegetation to provide foraging habitat for waterbirds • Maintain a sufficient depth of water around wetland vegetation to provide fish breeding habitat • Temporarily inundate the outer edges of the wetland to initiate the growth and recruitment of diverse vegetation communities while permanently inundating the inner wetland vegetation communities • Allow fish to move between the river, lake and estuary • Stimulate waterbug communities to breed for waterbird feeding • Dilute soil and surface water salts and initiate the decomposition of organic matter	B1, CN1, F1, MI1, V1, WQ1, WQ2
Summer/autumn drawdown (December to May) (targeting 0.3 m AHD)	• Dry out wetland fringing vegetation to reduce potential waterlogging of saltmarsh communities to support germination • Expose mudflats and margins to provide feeding habitat for wading/migratory waterbirds • Manage reed colonisation of low-lying areas by allowing drying and saline groundwater intrusion to reduce reed growth • Support a drying phase for vegetation communities that require drying to grow and recruit • Restrict carp movement and access to habitat • Allow vegetation to decay and soils to oxidise and release nutrients to improve lake productivity and maintain biogeochemical processes • Enable surface water/groundwater interaction by allowing saline groundwater to discharge to the wetland bed	B1, CN1, F2, V1, V2, V3, WQ2

Potential environmental watering action	Expected watering effects	Environmental objectives
Hospital Swamps		
Autumn/winter/ spring fill (April to November) and top-up as required (year-round) (targeting 0.5 m AHD)	• Maintain a mosaic of water depths and resources across the wetland, inundate various vegetation communities and create nesting, breeding and feeding opportunities for waterbirds, fish and waterbugs • Increase water levels to trigger fish spawning and waterbird breeding; high water levels will allow fish to access the wetland from the river • Increase freshwater to dilute the salt in the soil and surface water over winter • Initiate the decomposition of organic matter • Inundate the outer edges and margins to initiate the growth and maintain the condition of important wetland vegetation communities	 B1  CN1  F1  MI1  V1  WQ1, WQ2
Summer/autumn drawdown (December to May) (targeting 0.1-0.3 m AHD)	• Dry out the wetland fringing vegetation and expose mudflats and margins to support the feeding of wading/ migratory waterbirds • Manage reed colonisation of low-lying areas by allowing drying and saline groundwater intrusion to reduce reed growth • Support a drying phase for vegetation communities that require drying to grow and recruit • Restrict carp movement and access to habitat • Allow vegetation to decay and soils to oxidise and release nutrients to improve lake productivity and maintain biogeochemical processes • Enable the interaction of surface water and groundwater by allowing saline groundwater to discharge to the wetland bed	 B1  CN1  F2  V1, V3  WQ2

Scenario planning

Table 3.7.4 outlines potential environmental watering and expected water use in various planning scenarios.

A 2020 independent review of environmental watering at the lower Barwon wetlands recommended that Reedy Lake be partially drawn down on average in three out of four years and Hospital Swamps partially drawn down in most years. It also recommended the timing of planned drawdowns should be adapted to avoid disrupting significant waterbird breeding events.

Wet conditions in recent years have restricted planned drawdowns in the lower Barwon wetlands. The target drawdown at Reedy Lake has only been achieved once since 2019-20. Hospital Swamps has been drawn down more frequently but remained full during 2022-23. Drawing both wetlands down is a high priority where possible in all planning scenarios in 2024-25 to achieve environmental objectives in line with the 2020 watering regime review.

Wetland filling is proposed to commence as early as April but can occur at any point until November. Further top-ups may be needed throughout the year to achieve and maintain target water levels, particularly if waterbirds are breeding, and to provide some variability. Planned drawdowns can commence from December and continue until the following May at the latest to mimic natural seasonal patterns, but they will be delayed where required to avoid disrupting breeding waterbirds.

The planned wetland drying may be difficult to implement in the wet planning scenario, especially if there are multiple high-flow events in the Barwon River during summer and autumn. The planned wetland fill might also be difficult to achieve in the drought-dry planning scenario due to the wetland's potential disconnection from the Barwon River for long periods.

Table 3.7.4 Lower Barwon wetlands environmental watering planning scenarios

Planning scenario	Drought-dry	Average	Wet
Expected conditions	• Limited to no flow from the Barwon River in winter/spring • Disconnection between wetlands and the Barwon River for a long period • Natural drawdown may begin earlier than planned	• Some natural inflow from the Barwon River in winter/spring • More gradual lowering of water levels during drawdown	• Wetlands will be filled by overbank flow from the Barwon River • Stormwater inflow and local rain/run-off will provide regular top-ups • Drying of the wetland is unlikely
Reedy Lake			
Potential environmental watering – tier 1 (high priorities)	• Reedy Lake fill[1] and top-up (as required) • Reedy Lake drawdown	• Reedy Lake fill and top-up (as required) • Reedy Lake drawdown	• Reedy Lake fill and top-up (as required) • Reedy Lake drawdown[2]
Hospital Swamps			
Potential environmental watering – tier 1 (high priorities)	• Hospital Swamps fill[1] and top-up (as required) • Hospital Swamps drawdown	• Hospital Swamps fill and top-up (as required) • Hospital Swamps drawdown	• Hospital Swamps fill and top-up (as required) • Hospital Swamps drawdown[2]

1 The planned wetland fill might be difficult to achieve in the drought-dry planning scenario due to the wetland's potential disconnection from the Barwon River for long periods.

2 The planned wetland drying may be difficult to implement in the wet planning scenario, especially if there are multiple high-flow events in the Barwon River during summer and autumn.